

NUTRITIONAL NEEDS ASSESSMENT OF RURAL AGRICULTURAL MIGRANTS
OF SOUTHERN BRAZIL: DESIGNING, IMPLEMENTING AND EVALUATING A
NUTRITION EDUCATION PROGRAM

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ABSTRACT

A nutritional needs assessment was conducted among rural Brazilian agricultural migrant women (target group) and children (less than 5 years). The study was conducted in Vila Diogo, a slum located on the periphery of Nuporanga, a village in Sao Paulo state, Brazil.

A nutrition education program for the target group was designed and implemented on the basis of information obtained from a demographic/socioeconomic questionnaire, dietary and anthropometric assessment, and nutrition knowledge, attitudes/beliefs questionnaires. Dietary assessment included 24-hour food recalls, infant feeding practices, women's food preferences and frequency of food intake. Anthropometry consisted of weight, height, mid-upper-arm circumference (MUAC), and triceps skinfold (TSF) thickness measurements in women and children, with additional head circumference measurements in children less than 3 years.

Major findings from dietary assessment revealed that adult diets were simplistic, consisting primarily of rice, beans, and coffee (with sugar). Analysis of nutrient intake and comparison with international standards showed that women were probably at high risk for vitamin A, iron, calcium, ascorbic acid, and riboflavin deficiencies; children appeared at high risk for vitamin A, iron, and ascorbic acid deficiencies.

Infant feeding practices indicated that all children (under 5 years) had been breast fed at birth, although many were weaned at an early age.

Negative nutritional infant feeding practices were reported, especially for conditions such as fever and diarrhea.

Belief in the "hot/cold" food classification system was reported by women. Although food taboos were reported for menstruation, pregnancy, immediately post partum, and lactation, relatively few taboos had potentially negative nutritional consequences.

Anthropometric assessment indicated that a significant number of women were probably undernourished; a small percentage of women, however, were overweight or obese. Children did not generally appear undernourished; many, however, were stunted in growth.

Summative evaluation of the nutrition education program indicated that for women who participated in the program, nutrition knowledge scores showed improvement and were statistically significant at $\alpha = .05$, using Wilcoxon signed rank test.

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CHAPTER I

INTRODUCTION

1. General Description of Brazil

Brazil is the fifth largest country in the world and comprises approximately one-half the area of the South American continent (Figure 1). The country is divided into 5 major regions (north, northeast, south, southeast, and central-west), 23 states, 3 territories, and 1 federal district (Nyrop, 1983).

Brazil's geography is varied, ranging from coastal plains, savannah, and escarpment to tropical rain forest. Climatic conditions are also varied, ranging from tropical in the north to temperate in the south.

With an estimated population of 125 million in 1983 (Nyrop, 1983), Brazil ranks as the sixth most populated country in the world. The population, however, is unevenly distributed. More than 90% of the population reside in three regions (northeast, southeast, and south), representing less than 35% of the physical area (Roett, 1978).

Portuguese explorers discovered Brazil in the 1500's. Brazil became a Portuguese colony, obtaining its independence in 1822. Although Brazil elected to govern as a republic, the political power remained in the hands of a small elite group (Roett, 1978).

The present military government has been in power since the coup in 1964. Recently, the government has cautiously initiated a more liberal



Figure 1. Map of South America, outlining Brazil, Sao Paulo state, state capital, and project site.

policy in preparation for a possible return to civilian rule. General elections for state and federal representatives were permitted in 1982, the first election since 1964.

Brazil, considered the most industrialized of developing nations, has a population growth rate and age distribution typical of other developing countries. Growth rates in the early 1980's were estimated at 2.47%, one of the highest in South America (Nyrop, 1983). The age distribution of the population includes a large proportion of young people. In 1980, approximately 48% of Brazil's population was less than 20 years of age (Kluck, 1983). Other statistics in 1975 indicated that 19% of the population was 5 years of age or younger (Pollitt, 1981).

Brazilian society has been described as a highly stratified class system. One of the primary factors in the differentiation among the various classes of society has been family background. Other criteria, however, such as skin colour, wealth, occupation, education, and lifestyle have also been considered important.

Until the twentieth century, Brazilian society consisted primarily of two classes. These classes originated from the large plantations in which the small elite group of landowners provided a paternalistic environment for their workers (Weil et al., 1975; Kluck, 1983).

The structure of society gradually changed as industrialization began in the late nineteenth century. Industrialization resulted in an increasing number of urban dwellers who would eventually form the urban lower, middle, and upper classes. Weil et al. (1975) have categorized and estimated the size of six social classes as follows: traditional elite

(2%), new upper class (3%), middle class (15%), urban working class (semi-skilled, 20%), urban lower class (minimum wage earners, 35%), and the marginal poor (25%).

Brazil's predominant ethnic group, estimated to be 60% of the population, is of European descent. The remaining 40% includes African (7%), Amerindian (1%), Japanese (less than 1%), and a large interracial group of European, African, and Amerindian (Weil et al., 1975).

Economically, Brazil is both an agricultural and an industrial country. Although industry is responsible for a large percentage of the gross national product (GNP), agriculture still plays an important role in the economy. In 1975, 45% of export earnings were provided by agricultural products including coffee, cattle, sugar, soybeans, cotton, and cocoa. Brazil ranks among the top five countries in the production of coffee, bananas, sisal, beans, manioc (cassava), sugar, soybeans, maize, oranges, cocoa, jute, beef, and tobacco (Dickenson, 1978).

Natural resources such as timber, nuts, natural waxes, iron ore, gold, other metals and minerals are abundant. Coal and petroleum resources (fossil fuels), however, are lacking. Alternate energy sources such as alcohol (made from cane sugar), hydroelectric power, and nuclear energy have been investigated to decrease reliance on petroleum imports.

Agriculture's role in Brazil's economy decreased as industrialization expanded. Industrialization progressed rapidly after the military coup in 1964. Described as an economic "miracle", Brazil experienced GNP growth rates greater than 10% in the late 1960's to the early 1970's. These economic results were compatible with the government's developmental

philosophy of rapid economic growth. Little attempt was made to decrease existing socioeconomic disparities. Government believed that economic and social benefits would eventually "trickle down" to the population.

The economic boom, therefore, had relatively little positive economic and social impact for the majority of Brazilians. Although profits gained from the rapid growth of the industrial sector provided financial benefits for a small group of skilled labourers and the upper classes, the other social classes remained relatively unaffected (Nyrop, 1983). One explanation was that the availability of a large labour force was ignored in the industrialization strategy. Industries, instead, used capital-intensive techniques.

Income distribution also remained highly skewed. The gap between the rich and the poor actually increased (Hewlett, 1980). An estimated 40% of the country's income was acquired by the upper 5% of the population (Nyrop, 1983). The lower 50% of the population received less than 12% of the country's total income (Nyrop, 1983). The net result of Brazil's rapid economic growth was to widen the gap between the rich and the poor, and to increase regional disparity, with few positive economic and social benefits for most Brazilians (Hewlett, 1980).

Current international recession has had particularly detrimental effects on developing countries such as Brazil. Leading the Third World countries, Brazil has a foreign debt greater than 90 billion dollars, three digit inflation, massive unemployment, and crop failures due to regional floods and drought.

Rapid industrialization during the 1960's and 1970's also resulted in

massive rural-urban migration, particularly in the southeastern region of Sao Paulo state (Anonymous, 1979). The percentage of urban population in Brazil increased from 41% in 1940 to more than 55% in 1970 (Shrimpton, 1975; Dickenson, 1978; Hewlett, 1980).

Many factors are believed to be involved in the migration phenomenon. Examples include malnutrition, drought, desire to improve health, social and economic conditions, and the inability of the agricultural sector to absorb the increasing labour force and to provide well-paid and regular employment.

Inability of urban centres to cope with the influx of migrants has resulted in an increase in slums or squatter settlements. Frequently located on the periphery of the city, the slums are the most rapidly growing sectors of urban centres (Basta, 1977). The result is overcrowding, substandard housing, unhygienic environment, infectious diseases, and malnutrition.

The nature and magnitude of malnutrition in Brazil has been documented in several studies. The 1974 to 1975 National Household Expenditure Survey (ENDEF) conducted in Brazil indicated widespread moderate and severe deficits in energy intake, and a significant degree of malnutrition in children (Knight and Moran, 1979). Filho et al. (1981) reported regional differences in the prevalence of moderate and severe protein-energy malnutrition (PEM). Other investigations by Jansen et al. (1977), examined the nutritional quality of household diets as affected by income, urbanization, and region. Low income groups were reported to have low intakes of calories, protein, calcium, riboflavin, and thiamin.

Specific nutritional studies of agricultural migrant workers (Boias-Frias) have only been conducted recently. Investigations of agricultural migrants' diets in Sao Paulo state by Desai et al. (1980) revealed inadequate intakes of calories, calcium, iron, vitamin A, niacin, and ascorbic acid.

Resolution of the malnutrition problem is complex, due to its multifactorial etiology. Malnutrition can occur not only as a result of inadequate food intake, but due to other social, cultural, and biological factors affecting food intake and utilization. Any strategy(ies) selected to reduce or eliminate the malnutrition problem should consider a knowledge of the following factors: etiological factors in malnutrition, nutritionally vulnerable groups in the population, and the nature, degree, and magnitude of malnutrition in the population.

Use of nutrition education as a nutrition intervention strategy has been suggested by several investigators (Al-Isi et al., 1975; Church and Doughty, 1976; Ghosh et al., 1977; Tragler et al., 1981; Praun, 1982). Application of nutrition education theory is based on the assumption that ignorance or lack of nutrition knowledge plays an important role in the etiology of malnutrition. Al-Isi et al. (1975) also state that nutrition education may be particularly valuable in the presence of poverty because people could be taught how to maximize benefits from a limited income.

Few nutrition education programs for agricultural migrant workers or low income groups in Brazil have been reported. Drummond (1975), using the methodology of the Brazilian educator Paulo Freire, conducted a nutrition education program in northeastern Brazil. Wright (1982) used education as

a means of introducing the use of soybeans in favela (slum) households in Sao Paulo state.

Little government action can be expected for low income groups living in favelas because of the government's developmental philosophy. Furthermore, no measures have been introduced by government to decrease socio-economic disparities among various income groups. This situation has worsened because of the current international recession. Brazil's massive foreign debt, triple digit inflation, high unemployment, and recent crop failures have compounded the problems of low socioeconomic groups.

Considering Brazil's economic situation and political philosophy, no widespread social reforms to improve conditions for the less privileged in Brazilian society can be anticipated. Use of nutrition education, in these circumstances, could be the most appropriate intervention strategy. Nutrition education could stimulate an awareness of how people could make best possible use of limited resources and how they could assume more responsibility for their nutrition and health. As Al-Isi et al. (1975) have stated, nutrition education may be of particular value where poverty exists because people could be taught how to obtain maximum benefits from limited resources.

This study was designed to introduce a simple, informal nutrition education program to women (target group) living in Vila Diogo, a rural favela (slum) in Sao Paulo state. Design of the nutrition education program was based on results obtained from a nutritional needs assessment. Information was obtained from dietary intake assessments, infant feeding practices, dietary preferences, food intake frequencies and anthropometry.

It was recognized that the length of the study would be too limited to observe changes in nutrition attitudes and behaviours resulting from the nutrition education program. By administering a nutrition knowledge questionnaire before and after the nutrition education program, any changes in nutrition knowledge scores could be noted. Also, if participation in the nutrition education program was low, use of statistical tests of significance to determine effectiveness of the nutrition education program might not be possible.

2. Statement of the Problem

Previous studies in Brazil reported marginal malnutrition among urban slum dwellers. In this study a nutritional needs assessment was conducted among female household heads (target group) and their children under 5 years, living in a slum on the periphery of Nuporanga, a rural settlement in the Sao Paulo state, Brazil.

The study was conducted in cooperation with Dr. J.E. Dutra de Oliveira, University of Sao Paulo Medical School, Ribeirao Preto, and Dr. Elizabeth Jensen, Sao Geraldo Hospital, Nuporanga.

3. Aim of the Study

On the basis of information obtained from a nutritional needs assessment of the target group and children less than 5 years of age, the study was designed to implement an appropriate nutrition education program

for the target group and to evaluate its impact on nutrition knowledge.

4. Objectives of the Study

- a) To obtain information on demographic characteristics, socioeconomic situation, food and health related practices of favela residents (study population) by questionnaires addressed to the target group.
- b) To conduct a nutritional needs assessment of the target group and their children age 5 years or less by:
 - 1) Determining nutrient intake of the target group and their children over 2 and up to 5 years of age, using 24-hour food recalls addressed to the target group.
 - 2) Comparing nutrient intakes of the target group and their children over 2 and up to 5 years of age with internationally recommended nutrient intakes.
 - 3) Obtaining information on infant feeding practices, using questionnaires addressed to the mothers.
 - 4) Determining food preferences and frequency of food intake of the target group, using questionnaires.
 - 5) Determining the nutrition knowledge and attitudes of the target group, using questionnaires.
 - 6) Determining the anthropometric status of the target group and children under 5 years of age, using selected physical measurements.

- 7) Comparing anthropometric measurements of the target group and children under 5 years of age with international and Brazilian standards.
- c) To design and implement an appropriate nutrition education program for the target group, using information obtained from the nutritional needs assessment.
- d) To conduct a formative evaluation of the nutrition education program by using appropriately selected criteria.
- e) To determine the impact of the nutrition education program on nutrition knowledge of participants by comparing nutrition knowledge questionnaire scores before and after the nutrition education program.

5. Definition of Terms

- a) Boias-Frias - literal Brazilian translation is "cold meal eaters." The term refers to agricultural labourers who have migrated from the rural areas to urban slums.
- b) cruzeiro - Brazilian currency.
- c) favela - a Brazilian Portuguese term referring to a slum or shantytown.
- d) fazenda - a large Brazilian farm.
- e) formative evaluation - assessment of the quality of the instructional process (Cordera and Bobenrieth, 1981).

- f) malnutrition - the term has been commonly used to indicate inadequate nutrient intake or undernutrition (Berg, 1981).
- g) marginal malnutrition - mild malnutrition without apparent clinical symptoms.
- h) nutrition intervention strategy - planned action(s) undertaken for the specific purpose of improving the nutritional well-being of designated population groups (Austin, 1981).
- i) nutritional assessment - identification of nutritional needs and problems.
- j) peri-urban - location around the periphery of urban centres.
- k) summative evaluation - final outcome or impact of a program.
- l) weaning - cessation of breast feeding.

6. Organization of the Thesis

Chapter I presented a brief overview of Brazil's demography, socio-economic characteristics, and nutritional status of low income groups. This overview was followed by a statement of the problem, aim, and objectives of the study, and definition of terms.

A review of the literature is presented in Chapter II. Chapter III describes the methods and materials used in this study, followed by the results in Chapter IV. Chapter V consists of a discussion of the results. Finally, summary and recommendations are presented in Chapter VI.

CHAPTER II

REVIEW OF THE LITERATURE

1. Malnutrition

a) Introduction

Malnutrition has been defined as the pathological condition that results due to inadequate or excessive intake of one or more nutrients (Berg, 1981). The term "malnutrition", however, has been commonly used in the past to indicate inadequate nutrient intake or undernutrition (Berg, 1981).

In developing countries, extreme clinical manifestations of malnutrition known as marasmus and kwashiorkor appear in only a small percentage of the population less than 5 years of age. The severe forms of malnutrition, however, represent only the tip of the iceberg; a much larger proportion of the child and adult population suffer from mild or marginal malnutrition.

Development of malnutrition occurs as a slow, insidious, multistage process (Figure 2). The first stage involves inadequate dietary intake, followed by depletion of tissue stores and decreased plasma nutrient levels. The third stage results in reduction of nutrient biological activity, followed by impairment in cellular function. If malnutrition continues, clinical lesions occur which may lead to morbidity or permanent disability and death.

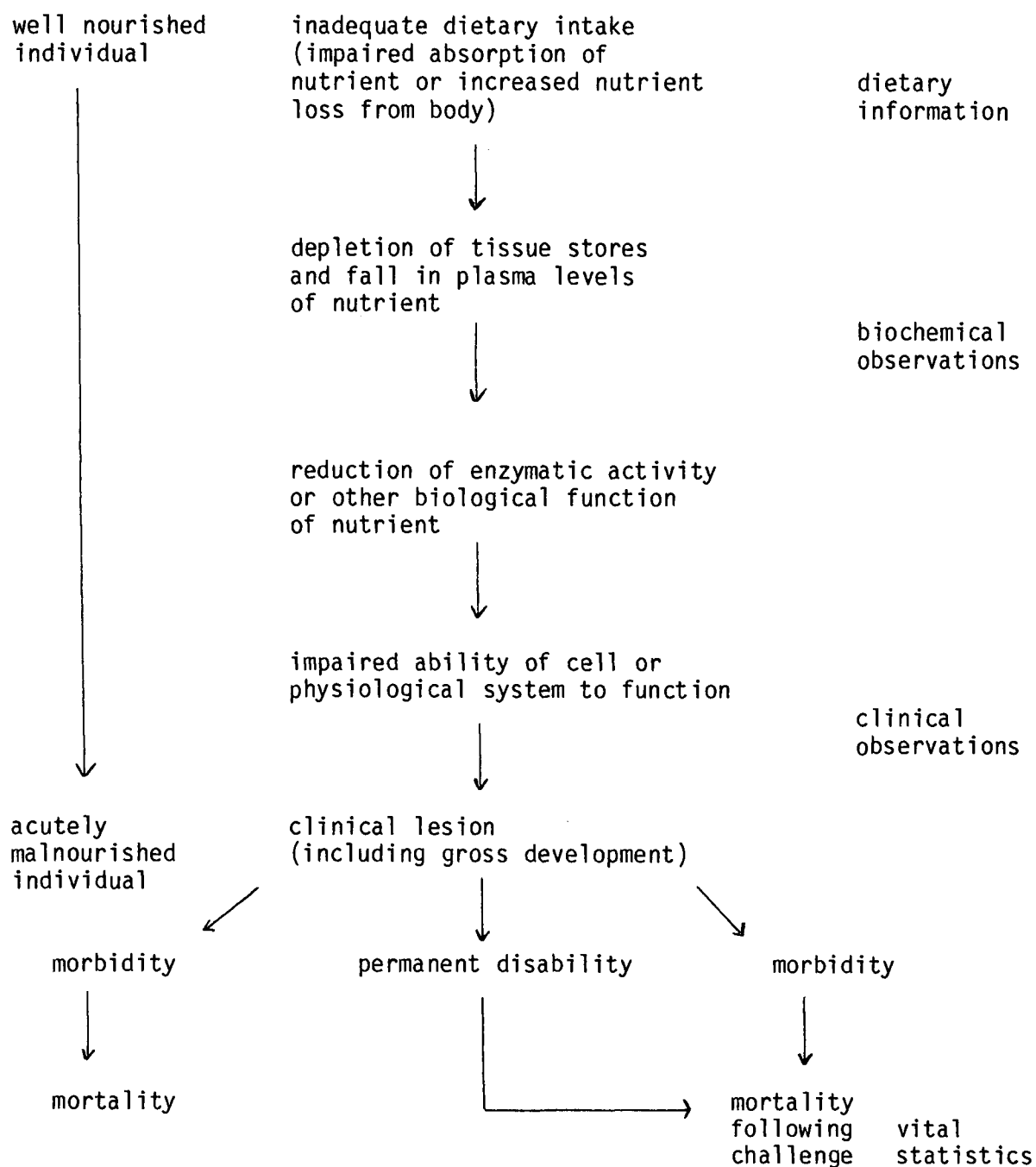


Figure 2. Stages of malnutrition and associated observations (Beaton and Patwardhan, 1976: 447).

Various indicators have been used in an attempt to identify malnutrition during the early stages. Use of dietary and socioeconomic surveys may provide information on potential malnutrition problems, whereas biochemical studies may indicate current nutrient status or nutrient reserves. Changes in growth patterns, as noted by anthropometry, may indicate the presence of malnutrition prior to the appearance of clinical symptoms. Clinical symptoms and morbidity data indicate the physical manifestations of malnutrition, with mortality data indicating the final outcome of the disease.

It is important, therefore, that indicators be identified that will distinguish malnutrition in its earliest stages in order that appropriate action(s) or intervention(s) can be initiated. There are economic and other advantages in controlling malnutrition during the early stages rather than attempting to repair damages that have occurred during the later stages (Gordon, 1976).

b) Marginal Malnutrition

As mentioned earlier, the severe clinical forms of malnutrition occur in a relatively small percentage of the population. A greater problem is the mild and moderate forms of malnutrition which do not present themselves clinically. Bengoa and Donoso (1974), as reported by Behar (1981), have estimated that although a mere 1 to 3% of children in developing countries exhibit severe malnutrition, up to 50% or more of children under 5 years of age may be suffering from pre-clinical or marginal malnutrition.

Identification of marginal malnutrition and determination of the magnitude of the problem presents a challenge. Indicators which may suggest

that marginal malnutrition exists or is a potential problem include dietary, socioeconomic, and biochemical parameters, and anthropometry.

c) Nutritionally Vulnerable Groups

Thomson (1975) and other investigators have described periods of greatest susceptibility to malnutrition in developing countries as occurring during perinatal life, the first five years of life, pregnancy, and lactation.

Nutritional vulnerability of children, especially infants, is due to the rapid growth rate and concomitant nutrient requirements (Jelliffe, 1966). In addition, infants rely on fetal stores to meet nutrient requirements for growth (Jelliffe, 1966). A lack of adequate fetal stores, resulting from deficits in the mother's nutritional status before and during pregnancy, may predispose to malnutrition.

In developing countries, several factors may cause susceptibility of infants and young children to malnutrition. The weaning period is usually a critical time in an infant's life. Psychological trauma of weaning, increased contact with contaminated or unhygienically prepared foods, physical environment, and illness can all contribute to malnutrition (Jelliffe, 1966). Furthermore, diets may be inadequate in quantity and quality to meet high nutrient requirements. Finally, susceptibility of young children to malnutrition may be increased as a result of poverty, infections, negative food attitudes and beliefs (Jelliffe, 1966).

Suskind (1977) and other investigators have noted that malnutrition affects immunocompetence. Severe protein-energy malnutrition (PEM) in

children affects various immune responses such as depressed reaction to skin test antigen and antibody response. These effects are reversed by improved nutritional status.

Pregnant and lactating women are considered a nutritionally vulnerable group due to increased nutrient requirements. In developing countries, pregnant and lactating women may be particularly at nutritional risk because they may be performing intensive physical labour during this time. Certain food taboos and beliefs detrimental to appropriate food intake, frequent pregnancies, short birth intervals, and prolonged lactation may enhance nutrition vulnerability (Jelliffe, 1966).

Depending on the timing, severity, and duration of nutritional deprivation, maternal malnutrition during pregnancy may have deleterious effects on the fetus and outcome of pregnancy (Suskind, 1977; Gabr, 1981). A strong, positive relationship between maternal nutrition and infant birth weight has been established. Studies of birth weights resulting from pregnancies that occurred during acute starvation, have reported increased perinatal mortality and a reduction in birth weights (Antonov, 1947; Gabr, 1981). Furthermore, severe maternal malnutrition during the critical period of fetal brain development, could retard mental development (Gabr, 1981).

In summary, high nutritional risks in developing countries are associated with large family size, short birth intervals, artificial infant feeding, early weaning, low socioeconomic level, high morbidity and mortality rates, high rates of low birth weight infants, food beliefs and taboos detrimental to good nutrition, and rural-urban migration (especially recent migration).

d) The Effect of Malnutrition on National Development

National developmental policies have generally not recognized the importance of human resources in national economic growth. Developmental experts maintain, for example, that human malnutrition is a barrier to economic growth and a wasting of human resources (Wilson, 1973).

Nutritional status of human resources has been recognized by some investigators as an important factor in a country's developmental process. Berg (1981) has expanded this idea and stated that:

"...overall nutritional status will determine
the rate and extent of national development."

The importance of nutrition in national development has resulted from evidence of poor nutrition on mental and physical development, work productivity, and span of working years. Because malnutrition exerts detrimental influences on human resources, the economic potential of the individual and of the nation are affected (Barg, 1973; Berg, 1973; Wilson, 1973).

When viewed in terms of the cost of national development, improved nutrition may play a role in the reduction of mortality rates, reduction of infection (severity and rate), and prevention of other malnutrition-related problems such as blindness and anemia (Berg, 1981). A significant advantage of improved nutritional status is the savings of medical costs associated with treating the malnourished. Berg (1973) suggests that the cost of improving nutrition is much less than the cost of curing or treating the final consequences of malnutrition.

Studies have demonstrated that severe malnutrition during human fetal life or early infancy may cause reduction in brain cell number and total brain size (Berg, 1973). The effect of mild or moderate malnutrition on mental development, however, is less well defined. Less severe degrees of malnutrition in children impair abilities to concentrate and learn, and result in apathy and unresponsiveness (Barg, 1973; Berg, 1973; Read, 1977). These effects may be partially responsible for school children suffering from mild or moderate malnutrition, to be school dropouts or repeaters (Berg, 1973).

The effect of malnutrition on physical development may not necessarily be significant in national economic terms. Growth retardation (stunting) may not be important in economic terms unless occupations depend on physical size (Berg, 1973). Low life expectancy rates of individuals in developing countries, however, is detrimental to a nation's potential for development due to a reduced working life span (Berg, 1973; Wilson, 1973). High child mortality rate is the main culprit, of which malnutrition is strongly implicated.

Studies have also indicated that malnutrition affects work productivity. Individual response to poor nutrition may result in working at a slower rate, working for shorter periods of time, or increased absenteeism (Berg, 1973). Several studies have demonstrated that improving nutrition in physical labourers has increased work productivity. A study by Wolgemuth et al. (1982) of Kenyan workers reported a 12.5% increase in work productivity when workers received food supplementation of 1,000 calories per day. Angeleli et al. (1983) found that physical work capacity of

marginally malnourished adult Boias-Frias increased 50% by simple food supplementation (an additional 355 kcal and 20 g protein). Other investigations by Desai et al. (1981, 1984) indicated lower physical work performance and work capacity in Boia-Fria children compared to well-to-do counterparts.

e) Nutritional Problems in Brazil

One of the earliest and most comprehensive nutrition surveys in northeastern Brazil was conducted by the Interdepartmental Committee on Nutrition for National Development (ICNND) in 1963. This region, susceptible to drought, demonstrated diets to be inadequate in energy, vitamin A, ascorbic acid, riboflavin, and calcium (ICNND, 1965).

In 1961 to 1963, family budget surveys were conducted by the Brazilian Institute of Economics of the Getulio Vargas Foundation. Results indicated the northeastern region of Brazil as having the greatest nutrition problems, with 75% of the population consuming energy deficient diets (Shrimpton, 1975).

An epidemiological survey by Simmons (1976), investigating the degree of xerophthalmia and vitamin A blindness in northeastern Brazil, found peak incidence of xerophthalmia occurring at 1 year of age. In most cases of xerophthalmia, signs of PEM, anemia, and parasites also occurred.

Nutritional assessment of children attending creches in Sao Paulo city was conducted using dietary and anthropometric methods (Sgavoli and Travaglini, 1978). Diets given at the creches provided (except for protein) only 30 to 50% of daily nutrient recommendations, with diets

particularly deficient in vitamin A, ascorbic acid, and minerals. Anthropometry indicated that children from poor socioeconomic backgrounds had a high prevalence of malnutrition.

Studies by Filho et al. (1981) in three Brazilian state capitals reported less PEM in children under 5 years of age living in Sao Paulo city, an industrial centre, than in two northeastern cities located in less developed areas. Another nutrition survey of a poor urban community reported 27% of children (1 to 2 years of age) suffering from moderate to severe malnutrition (Dorea et al., 1981).

Investigations, by Desai et al. (1980, 1983) of agricultural migrant families living in slums, reported that more than 15% of the study population consumed less than one-third of suggested Food and Agriculture Organization's (FAO) recommended energy intakes. Severely deficient intakes of vitamin A, riboflavin, niacin, and ascorbic acid were generally observed, with extreme inadequate intakes of calcium and iron reported for females.

Interest in infant feeding practices has been expressed because early weaning or specific weaning and infant feeding practices may cause malnutrition. A study by Sousa et al. (1975) of weaning patterns among low socioeconomic families in southern Brazil, reported 24% of respondents did not breast feed infants for any time period. For infants who began breast feeding at birth, more than 70% of infants were bottle feeding by 2 months of age.

A study of breast feeding patterns in immigrant families, living in Sao Paulo city, indicated a prolonged breast feeding period of almost 12 months (Issler et al., 1982). Concern was expressed, though, that urban

influences might decrease the duration of breast feeding in the future. Finally, Desai et al. (1980) reported that 30% of women from a peri-urban population of Ribeirao Preto terminated breast feeding by 6 months, and 80% by 12 to 18 months.

2. Ecology of Malnutrition

a) Introduction

Malnutrition is due not only to a lack of food but a host of other interrelated factors. Scrimshaw (1964) has discussed many of the relationships involved in the etiology of malnutrition using the epidemiological model (agent, host, and environment).

The agent in the epidemiological model of malnutrition is the deficiency of an essential nutrient. Together with environmental factors such as soil, climate, infection, government policies, income distribution, land tenure, nutrition knowledge, and adequacy of food distribution, to cite a few, the agent affects man, the host. Host characteristics include age, sex, and physiological state. Specific physical, sociocultural, and biological factors and their role in the etiology of malnutrition will now be examined in greater detail.

b) Physical Factors

Major physical factors which could cause malnutrition are land, climate, energy, and food loss. Agricultural production, influenced by the quantity, quality, and utilization of land resources, can be a key factor

in the development of malnutrition. The amount of land available for food production, for instance, must be sufficient to ensure an adequate food supply for the population and to minimize the need for food importation. Furthermore, poor soil fertility, occurring as a result of over-utilization of land resources or erosion, could cause a reduction in agricultural production.

Land resources may also be under-utilized. The Food and Agriculture Organization (FAO) has estimated that only 45% of potentially arable land in developing countries is used (Caliendo, 1979). The potential for increasing food production, therefore, is great.

Climate is another important factor in food production. Extreme climatic conditions such as droughts, flood, hail, hurricanes, snow, or untimely frost can destroy food crops, food stores, and animals (Williams, 1966; Malcolm, 1974; Caliendo, 1979).

High environmental temperatures and humidity can cause significant nutrient loss such as sodium, chloride, copper, iron, and nitrogen through sweating (Scrimshaw, 1964; Malcolm, 1974). In countries where reduced sunlight occurs during winter months or where sociocultural factors limit exposure to sunlight, vitamin D deficiencies may result (Scrimshaw, 1964). Hot, humid climates also provide an excellent medium for the growth and proliferation of insects, viruses, bacteria, and other parasites, resulting in reduced crop yields or decreasing man's ability to utilize nutrients from food sources (Mata, 1977).

In 1983, Brazil experienced both drought and floods. The northeastern Brazilian states have suffered extreme drought during the past several

years. On the other hand, several southern states in 1983 experienced widespread flooding which destroyed food crops. More foreign exchange will, therefore, be spent on the importation of foodstuffs to overcome deficits in domestic food production.

Energy may exert an indirect role in causing malnutrition. High or increasing energy costs result in the increased costs of food production, transportation, and processing (Caliendo, 1979). Increased costs of agricultural production are ultimately passed on to the consumer in the form of higher food prices. If the consumer is financially unable to cope with increased food costs, a reduction in food purchasing and consumption could potentially lead to malnutrition.

In the 1970's, international energy prices skyrocketed as petroleum product prices increased. Countries lacking domestic petroleum resources, such as Brazil, were forced to import petroleum at greatly increased costs. Brazil, in turn, increased production of alternate energy sources such as alcohol (made from cane sugar) to decrease reliance on petroleum imports.

Brazil's emphasis on increasing alcohol production as a fuel source may be viewed as both a positive and a negative influence on food production. Use of less expensive fuel sources, such as alcohol, should theoretically reduce food production and transportation costs. Production of alcohol, however, requires vast areas of land in the cultivation of sugar cane. Such use of land for fuel production eliminates availability of land for domestic food production.

Food loss, due to improper or inadequate storage facilities,

contamination, or other factors, will reduce the quality and quantity of food available for national and household consumption. Losses may occur as a result of insect or rodent infestation, bacterial, fungal, or mold growth (Robson, 1972), contamination, or even smuggling food into neighbouring countries for foreign currency. Food loss estimates indicate that as much as 10 to 40% of food produced in developing countries may be lost or wasted during storage, processing, and transportation (Robson, 1972; Caliendo, 1979; Gorgatti-Netto, 1979; Schatz, 1979).

Food losses may occur during pre- or post-harvesting. Pre-harvest losses may occur due to disease, birds, rodents, insects, micro-organisms, viruses, inefficient machinery, or weather, with post-harvest losses occurring during drying, storage, transportation, processing, packaging, handling in warehouses, and at the household level (Anonymous, 1979; Gorgatti-Netto, 1979; Schatz, 1979).

A 1971 study of fruit and vegetable losses at the wholesale and retail level in two Brazilian cities indicated a variation in loss from 5 to 34%, depending on the food item and efficiency of the marketing system (Gorgatti-Netto, 1979). In northern Brazil, an estimated 80% of the cashew fruit harvest is lost due to fungal attack, inadequate capacity of local markets to absorb the quantity produced, or inability to process or transport to other markets (Gorgatti-Netto, 1979). Other surveys conducted by the Brazilian Ministry of Agriculture reported 5 to 20% cereal grain losses during storage in warehouses and silos (Gorgatti-Netto, 1979). In 1983, the city of Sao Paulo discarded thousands of litres of milk due to contamination that occurred during processing.

c) Sociocultural Factors

Numerous political factors exert an influence on the development of malnutrition. War and civil disorder may cause food shortages, resulting in famines that lead inevitably to malnutrition for all or segments of the population. Historical examples of malnutrition as a byproduct of war include the siege of Leningrad, Bangladesh, Nigerian-Biafran war, and the Ethiopian-Eritrean war, to cite a few.

If government policies such as food rationing or buffer stocks were initiated, more food supplies would be available during periods when supplies would be low (Scrimshaw, 1964; Caliendo, 1979). Furthermore, government intervention in food prices such as food price subsidies, price controls, special taxes or duties, and pricing policies determine who is able to buy food and how much (Scrimshaw, 1964; Caliendo, 1979). In Brazil, for example, removal of price subsidies for wheat in 1983 resulted in a 100% price increase for flour.

Economic considerations such as income (amount and distribution), unemployment rates, inflation, national debt loads, and social services are created by government policies and philosophies. Brazil's massive foreign debt load of \$90 to 92 billion and an estimated 175% inflation rate have resulted in government actions of currency devaluation, severe wage increase restrictions, and removal of imported food price subsidies. Such stringent economic measures are likely to be most detrimental to segments of society most at risk for malnutrition.

Availability of food alone, however, does not necessarily ensure its consumption. Food habits are formed primarily as a result of cultural and

societal values, with beliefs, values, and taboos influencing and determining who eats what, when, and where. Furthermore, all potentially edible food sources are not consumed (Jelliffe, 1966). Sociocultural factors classify what items are edible or not; and what foods are appropriate for different age groups, sex, physiological states, special occasions, and illness (Jelliffe, 1966; Sanjur, 1982). Food taboos during illness or during different physiological states, cultural "super foods", and prestige or status foods are also determined by society (Jelliffe, 1966; Devadas, 1970; Sanjur, 1982).

Various cultural factors affecting food habits may contribute to the development of malnutrition, such as the restriction of food during pregnancy to prevent a difficult delivery (Devadas, 1970). Consumption of eggs by young girls may be forbidden in some cultures because of the belief that eggs cause infertility; fish consumption by children in other cultures is believed to cause worms. Withdrawal of food during illness may be a significant factor in the development of malnutrition, especially in children. Modern prestige foods, for example, processed or refined food items (white polished rice, white flour, white sugar, carbonated beverages, candy), may be responsible for poor nutrition.

The age at which supplementary or weaning foods are introduced into the infant's diet, as well as the quantity and type of weaning food, may be a critical factor in the development of malnutrition. Weaning foods high in carbohydrate, low in protein or containing no protein may, for instance, cause kwashiorkor.

Food habits are also determined by the individual's food preferences.

Of the several factors which affect food preferences, characteristics of the food such as texture, appearance, odour, colour, temperature, availability, and ease and method of preparation are probably the most important (Randall, 1982). Other factors which affect individual food preferences may include age, education, and attitude to experimentation with new foods (Randall, 1982).

Finally, food habits are influenced by the physical availability of food, including food production, distribution and purchasing power (Sanjur, 1982). Food distribution patterns within the household, for example, are determined by societal and cultural values. In some cultures, the male head of the household is expected to eat first and is given the largest and/or best foods, with women and children eating last (Devadas, 1970). If food is limited in quantity and/or quality, the effect of food distribution on nutritional status becomes apparent, particularly in nutritionally vulnerable groups such as young children, pregnant, and lactating women.

Malnutrition has played an important role in affecting population growth. An examination of factors responsible for the dramatic increase in population since the 18th century reveals population expansion was not due to increased birth rates, but due to a decline in mortality from infectious diseases (McKeown, 1976). Although a decline in infectious diseases was partially due to improved hygiene (water purification, improved food hygiene, efficient sewage disposal), better medical measures, and immunization, the primary reason was an improved nutritional state resulting from increased food production (McKeown, 1976).

At the household level, it is widely accepted that high parity and

short birth intervals may result in malnutrition (Taylor, 1973; Ballweg, 1975). Studies in India (Shah, 1979) reported that in rural areas, 46.2% of young children from small families and 62.5% of young children from large families weighed 70% or less than the reference weight. In urban areas, 12.5% of young children from small families as compared to 20% from large families, weighed 70% or less of the reference weight. Other studies conducted in Colombia and Bangkok (Ballweg, 1975) found similar results; as family size increased, the proportion of malnourished children increased.

High parity has negative nutritional consequences for the mother as well as the child. These consequences may include maternal anemia, low weight for height, increased pregnancy wastage and malnutrition, infant anemia, and impaired growth rate (Caliendo, 1979).

Birth intervals have been suggested by some investigators to be as important as family size in contributing to maternal and child malnutrition (Ballweg, 1975; Caliendo, 1979). Short intervals between births increases the mother's risk, if poorly nourished, to produce a low birth weight infant or increase perinatal mortality (Wishik and Stern, 1972; Caliendo, 1979). Decreased birth intervals increases the nutritional risk for mother and child because the mother's resources may not be repleted prior to the succeeding pregnancy (Austin, 1980).

Studies in India indicated that with birth intervals of one year or less, 1.9 times as many children were moderately to severely malnourished as compared to children with birth intervals of three to four years (Shah, 1979). Other studies conducted in Colombia and Bangkok reported similar findings (Ballweg, 1975).

What the appropriate minimum birth interval should be, is not known. An appropriate interval between births would depend on the nutritional state of the mother pre- and post partum, nutritional quality and quantity of the diet, length of the lactation period, and presence of illness or infections. Wishik and Stern (1972) suggest that a 12 month interval between births is too short; data from other studies appear to suggest a period exceeding 24 months between births (Huffman, 1984).

The education level of adults has been implicated as an ecological factor in malnutrition. Cravioto (1970) suggests that minimal schooling and illiteracy lead to continued erroneous health beliefs and attitudes; a cycle which continues when poorly educated persons marry others of similar educational background. In a Sao Paulo survey, results indicated that illiteracy rates of male heads of households were greater in families with malnourished children (Austin, 1980). A higher level of education has been positively associated with higher incomes, with more money theoretically available for food purchases (Sanjur, 1982). Although higher levels of formal education have been positively associated with food consumption habits, other sociocultural factors such as food attitudes, beliefs, and taboos play an equally important role in food intake.

Poverty has been recognized as one of the basic underlying causes of malnutrition (Devadas, 1970; Caliendo, 1979; Schuftan, 1979; Austin, 1980; Berg, 1981, Martorell, 1983). Lowenberg et al. (1968) state that malnutrition usually is found where poverty exists; this is the rule, not the exception. Poverty has also been described as a vicious circle:

poverty —→ inadequate food —→ malnutrition and disease —→
poor working capacity —→ poverty (Devadas, 1970).

Factors contributing to poverty are high unemployment, underemployment, and low wages (Austin, 1980). The potential for malnutrition is high because a low income may be insufficient to purchase adequate food supplies, even if food supplies are available (Anonymous, 1978).

The magnitude of poverty in South American countries is high, with approximately 45 to 50% of households in Peru, Brazil, and Colombia falling below the poverty line (Pollitt, 1981). Furthermore, more than 20% of children under 5 years of age in Brazil, Colombia, Ecuador and Peru are unable to obtain basic needs (Pollitt, 1981).

Poverty has also been described as a syndrome (Schuftan, 1979), implying an underlying cause. Any attempts to reduce or eliminate poverty would require action against the basic cause; the cause being defined as the result of national developmental philosophies.

National development in non industrialized countries, based on the principle of economic growth, has not resulted in economic benefits "trickling down" to the low socioeconomic classes as had been expected. The crux of the matter, regarding financial benefits potentially available from economic growth, exists in the philosophy of how financial benefits will be distributed within the population.

Reduction or alleviation of poverty requires political interventions and risks. Many mechanisms such as income generation, income redistribution or supplementation, and food subsidies and government pricing policies could be employed to increase the purchasing power of the poor.

Income for the unemployed could be generated by job creation, using labour-intensive rather than capital-intensive techniques (Schuftan, 1979). Redistribution of income could be accomplished by land reform, progressive taxation on income and property, and differential salary adjustments in favour of lower income groups, and nationalization of natural resources and financial institutions (Anonymous, 1978; Schuftan, 1979). Food rations, subsidization of consumer prices, guaranteed price for food producers, and consumer price index adjustments are other mechanisms that could be implemented to increase purchasing power. Other government actions could include establishment of labour unions with bargaining authority, adequate guaranteed minimum wage, paid sick leave, pension benefits, health insurance, and job security.

Increased income, however, does not automatically ensure improvements in diet and nutritional status. Increases in inflation rates and other demands on income such as increased taxation, rent, and additional household expenses may decrease the amount of income actually available for food expenditures (Caliendo, 1979). Dietary intakes, as a result, may become inferior in quantity and quality.

Finally, increased purchasing power also does not guarantee that the additional income is used to purchase food items. Studies in India by Mellor and Lele (reported by Berg, 1973) indicated that the allocation of additional income to food expenditures varied, depending on the initial income. The lower the initial income, the greater the percentage of additional income that was spent on food items, with 76% of additional income in low income groups allocated for food compared to 34% in the high

income groups.

Increasing urbanization, currently a world-wide phenomenon, is able to influence food habits and nutritional status. Many motives such as malnutrition in the rural areas, desire for improved economic, health and social conditions, lure of the city, income disparity between rural and urban areas, better urban facilities, and lack of future in rural areas have been suggested for rural-urban migration (Krumdiek, 1971; Smith, 1974; May, 1975; Weil et al., 1975; Basta, 1977; Ward and Sanders, 1979; Ifekwunigwe, 1979; Clark, 1980, den Hartog, 1981).

In Brazil, massive rural-urban migration occurred during the 1960's, especially in the southeastern regions such as Sao Paulo state (Weil et al., 1975; Anonymous, 1979). Massive rural-urban migration in Brazil has resulted in rapid growth of favelas (slums) which, together with accelerating inflation and government policy of intensive capital investment in industry and agriculture, provide less available income for the urban poor (Ifekwingwe, 1979; Ward and Sanders, 1979). These circumstances have had a deleterious effect on the health, work productivity, nutritional status, and education of slum dwellers (Anonymous, 1980).

Other factors may exert negative influences on nutritional status during rural-urban migration. People migrating to urban centres, for instance, may no longer be able to grow their own food and income will be required to purchase all food items (den Hartog, 1981). Furthermore, migrants may experience unemployment, underemployment, increased housing and transportation expenses, and inadequate cooking facilities (den Hartog, 1981). Previous reliance on relatives for necessary assistance during times

of need may also no longer exist as family networks are often broken during migration.

Various studies in developing countries have indicated that although urban dwellers consumed a greater variety of foods and more animal protein, mean energy intake was less in the urban poor compared to the rural poor (den Hartog, 1981). Qualitative aspects of the urban migrant's diet may also change, with nutritious foods being exchanged for less nutritious ones such as empty energy foods (alcohol, carbonated beverages, sweets) and highly refined or processed foods (May, 1975).

Probably the greatest effect of urbanization on dietary patterns has been in infant feeding. Numerous surveys in developing countries report that the duration of breast feeding decreases as urban migration occurs. Early weaning may result in poor nutritional status in the infant. Problems associated with artificial feeding in an unhygienic environment, plus a low income, and its effects on nutritional status are well known.

The magnitude of malnutrition among the urban poor has not been widely studied nor documented. Urban statistics may underestimate the true health and nutritional problems of urban slum dwellers because many are illegal squatters and, therefore, do not appear on official statistics (Basta, 1977). Furthermore, statistics indicate a more favourable situation in the slums than exists in reality due to the wide disparity between the urban rich and urban poor (Basta, 1977).

d) Biological Factor

1) Infection and Malnutrition

Infection is a major factor in malnutrition, if food availability is not the limiting factor (Mata, 1979). In developing countries, infective agents (bacteria, viruses, helminths, protozoa) have ideal conditions for growth and survival (Mata, 1979).

Infectious diseases in humans may have important economic implications in the national developmental process. If a large proportion of the population is infected (for example, malaria, hookworm, schistosomiasis), a decrease in physical productivity, due to reduced physical stamina, will occur (Scrimshaw et al., 1968). Prevalence of infectious diseases in animals may also have important nutritional implications for man by limiting the type or quantity of animals raised for food sources or income (Scrimshaw et al. 1968).

The impact of infection per se on nutritional status is basically a reduction of nutrient supplies available for growth and development (Martorell, 1983). Anorexia, vomiting, malabsorption, or impaired digestion could result in decreased food intake or utilization.

Infection may indirectly influence malnutrition by its interaction with sociocultural factors. At the household level, poorly constructed houses, inadequate or improper sanitary facilities, poor personal hygiene, inadequate food preparation methods, or the presence of infected domestic animals in or near the house, contribute to the growth and transference of infectious agents to man (Mata, 1979). Furthermore, the attitudes and taboos regarding food intake during infectious diseases could initiate or

enhance the already existing malnutrition.

Bacterial, viral, and protozoal infections are known to increase urinary and intestinal nitrogen loss; protozoal infections such as malaria cause increased ascorbic acid excretion and iron loss (Scrimshaw et al., 1968). If subjects suffering from infections also consume inadequate diets, the negative effect on nutritional status could be significant.

Helminthic infestations exert a definite influence on nutritional status. In children, helminths may cause decreased digestion time and absorption of food, mechanical blockage, and mucosal damage; hookworm, for instance, may result in significant blood loss (Scrimshaw, et al., 1968).

e) Interrelationships Among Ecological Factors

Many attempts have been made to identify and portray the relationship of various ecological factors to food intake behaviour, nutritional status, or malnutrition (Williams, 1966; Cravioto, 1972; Malcolm, 1974; Pelto, 1981; Sims, 1981). Lowenberg et al. (1968) state:

"The true roots of malnutrition ramify very deeply into the social and economic fabric of society. In practice, all of the so-called causes are interrelated and interdependent: agriculture, climate, economics, cultural and social patterns, transportation, communications, education, and even religion exercise influences."

Numerous studies have been conducted to identify the specific factors involved in the development of malnutrition, and to determine the type and strength of the relationship that may be present. Garn et al., (1978) studied the effect of socioeconomic status, maternal education, and household income on weight, length, and head circumference during various age levels in white and black Maryland children. Results indicated that children of a higher socioeconomic status were heavier, taller, and had a greater head circumference than children from lower socioeconomic levels. Household income exerted more of an effect than other variables in black subjects, with maternal education exerting a greater effect in white subjects.

Greiner and Latham (1981), in studying mothers and children 1 to 2 years of age living in St. Vincent, found that the age breast feeding ceased was the most statistically significant variable associated with weight for age. Similar results were reported by Smith et al. (1983) in a Haitian study where age of weaning was the most important variable associated with malnutrition (measured by height for age). Other important factors to children's nutritional state were the amount of money spent for food and availability of food from home gardens.

In a study of food distribution within Moslem households in Bangladesh, Carloni (1981) reported a greater intake of food by males of all age groups. Furthermore, using weight and height for age as criteria for measuring malnutrition, more girls were severely malnourished than boys.

A study of young children in rural Guatemala by Valverde et al. (1981) found less growth retardation as family income increased. This finding was

supported by Francois et al. (1982) who reported that the greatest nutritional risk in Tunisia occurred in large households with low incomes.

Lastly, Aguilon et al. (1982) investigated the effect of numerous variables on weight for age of Philippine pre-school children. Results indicated the highest correlations existed between type of infant feeding, income of household, age at weaning and weight for age.

3. Nutritional Assessment

a) Introduction

Nutritional assessment may be defined as the determination of nutritional well-being of an individual, group or a population. The level or state of nutritional well-being may be termed nutritional status. Determination of nutritional status relies on indicators to identify whether nutritional problems exist and if they exist, to what extent or degree.

Four components of nutritional assessment are anthropometry, clinical examination, biochemical analyses, and dietary evaluations. Each will be discussed in the following sections.

b) Dietary Assessment

Dietary assessment involves the determination (quantitative or qualitative) of food intake of an individual, group, or a population. Methods selected to assess food intake depend on the purpose of the assessment, the group or individuals to be assessed, degree of accuracy and precision required, and availability of financial and human resources (Pekkarinen, 1970).

Types of dietary assessment methods available are food balance sheets, food accounts, food records, weighed food intakes, diet history, and diet recall (24-hour food recall). No one method is ideal because all methods differ in advantages and limitations.

Data from food balance sheets, for instance, provide an estimate of available food for a country's population on a per capita basis. Results, however, overestimate the amount of available food because no allowances are made for wastage and the amount of food consumed on a per capita basis is not known (Pekkarinen, 1970). Food accounts exhibit the same limitation as food balance sheets in that only the amount of available food per person and not the actual amount consumed is known.

Food records do take into account food wastage and permit relatively accurate information to be obtained regarding nutrient intake. Recording of food intake, however, requires subject literacy and cooperation (Pekkarinen, 1970; Young, 1981).

The weighed food intake method produces the most accurate and reliable results of all dietary intake methods. Limitations which deter its use are cost and the considerable time involved. Furthermore, if conducted by trained personnel, invasion of household privacy is possible, with possible changes in subject's eating patterns.

Diet history provides information regarding the individual's past food habits, preferences, allergies, eating patterns, and variations in dietary intakes (Burke, 1947). Information obtained may be used to monitor changes or trends in eating patterns (Pekkarinen, 1970).

One of the most popular diet recall methods, which may be used to obtain information on dietary intakes of population groups, is the 24-hour food recall. Although this method does not represent usual intake and relies on subject's memory and ability to accurately judge portion size, it is inexpensive and subject cooperation is high.

Nutrient intake for individuals or groups, based on information obtained from dietary intake methods, may be determined using food composition tables or chemical analyses. Although food composition tables only report mean nutrient values and do not account for variations due to season, plant variety, soil, rate of growth, and cooking losses, the time factor and low cost involved make it popular for determination of individual and group nutrient intakes (Eagles et al., 1966; Marr, 1971). Furthermore, high correlation coefficients between the two methods were reported, particularly if food composition tables were derived from analytical data of local foods (Marr, 1971).

Numerous factors such as cost, number of trained personnel required, degree of subject's motivation and cooperation, subject's memory, communication skills, validity, and reliability are important to consider when selecting an appropriate dietary intake method. Of all the factors mentioned, validity and reliability are probably the most important (Marr, 1971; Houser and Bebb, 1981; Young, 1981).

Many studies have been conducted to compare validity and reliability among various dietary intake methods (Pekkarinen, 1970; Linusson et al., 1974; Karvetti and Knute, 1981; Stunkard and Waxman, 1981; Stuff et al., 1983; Todd et al., 1983). Results indicate that weighed food intake is the

most valid and reliable method, with the 24-hour food recall and diet history providing relatively valid mean results for groups, but not for individuals.

In summary, all dietary intake methods have limitations and vary in their degree of validity and reliability. Use of the 24-hour food recall in obtaining mean estimates of group dietary intakes may be the most appropriate method to use in developing countries because subjects need not be literate, method is less time-consuming, and less invasion of privacy occurs. Although the 24-hour food recalls may not represent usual intake, this may be of less concern if subjects' diets vary little from day to day.

c) Anthropometry

Brozek in 1956 (as reported by Johnston, 1981) stated that a relationship existed between history of dietary intake and body size. Physical body measurements or anthropometry then became a useful tool to monitor growth and identify the prevalence and severity of malnutrition in populations.

Anthropometry is especially useful in children because nutrient requirements are highest during the growing period. Retarded growth is the first and most sensitive indicator of malnutrition in children (Austin, 1980). Poor nutrition may be reflected in a small body size, reduced fat stores and muscle mass, and retarded rate of biological maturation (Johnston, 1981).

Growth is influenced by several factors such as sex, intrauterine environment, birth order, birth weight in single and multiple pregnancies, heredity, dietary intake, and environmental factors (climate, season, socioeconomic level, and infection) (Jelliffe, 1966). Studies indicate that nutrition and environmental factors are the most important influences on growth (Jelliffe, 1966).

Advantages of anthropometry are that measurements are non invasive, equipment is relatively inexpensive, and local personnel can be trained to conduct measurements (Johnston, 1981). Evaluation of anthropometric data, however, is difficult. For instance, abnormally low anthropometric values do not necessarily indicate deficiencies of specific nutrients because low values may be due to factors other than malnutrition (Johnston, 1981).

Anthropometric values are compared to reference standards. In conducting anthropometric surveys in developing countries, use of local reference standards are preferred, but these are often not available. Comparison of values with international reference standards, then becomes the only alternative.

Anthropometric measurements may be expressed in numerous ways. One of the most popular expressions is weight for age. Monitoring weight for age over a period of time is a common method of measuring adequacy of growth in children. Weight for age, however, does not differentiate between recent (acute) and long-term (chronic) malnutrition (Waterlow et al., 1977). Furthermore, this index overestimates the number of malnourished children by including those children unusually small for their age (Richardson, 1980).

Height for age, on the other hand, is an indicator of past nutritional state; although a low index does not indicate when growth failure occurred. A disadvantage of both weight for age and height for age is that a knowledge of the child's age is required; a fact not accurately known, necessarily, in developing countries.

Weight for height as an index has several advantages compared to weight and height for age. The most important advantage is that the index does not require knowledge of the child's age. Secondly, weight for height index considers frame size and is an indicator of current nutritional state (Waterlow et al., 1977).

Mid-upper-arm circumference (MUAC) is a simple measurement of upper arm circumference; the value of which remains relatively constant in children less than 5 years of age (Shakir and Morley, 1974). This index indicates severity of malnutrition as exhibited by muscle wasting (Shakir and Morley, 1974; Miller et al., 1977), although this method is less sensitive than weight for height in detecting malnutrition. Measurement of triceps skinfold (TSF) thickness indicates the degree of subcutaneous fat and is an indicator of energy reserves (Miller et al., 1977). Calculation of mid-upper-arm muscle circumference (MUAMC), using TSF and MUAC values, estimates the amount of muscle tissue (Jelliffe, 1966).

Head circumference is a useful index in the detection of malnutrition, especially in children. Brain growth occurs rapidly during the first few years of life. Malnutrition, depending on the severity, could, therefore, affect head circumference.

Although many other types of anthropometric measurements exist, suggested measurements for nutrition surveys or assessments are height, weight, triceps skinfold thickness and arm circumference for all age groups, supplemented by head circumference in children (Jelliffe, 1966).

d) Biochemical Analyses

Biochemical tests are a useful adjunct in nutritional assessment. Tests may detect abnormalities of nutrient levels before any changes are noted clinically (McLaren, 1975). A variety of body tissues and specimens such as hair, liver, nails, muscle, saliva, bone, blood, and urine may be used. In nutrition surveys, blood and urine specimens are the most convenient samples to obtain for analysis.

Some biochemical tests are specific for certain vitamins and minerals (Austin, 1980). Correct interpretation of biochemical results is important. Some biochemical test values are indicative of recent nutrient intake; other values reflect nutrient intake over a long time period.

Advantages of biochemical tests are related to their accuracy and reproducibility (McLaren, 1975). Biochemical tests, however, are expensive, time-consuming, levels of normality and abnormality are difficult to assess, and trained personnel and laboratory facilities are required (Jelliffe, 1966). Furthermore, in conducting nutrition surveys, adequate transportation and storage facilities are of primary importance. Finally, tissue or specimen sample in developing countries may be difficult to obtain due to cultural unacceptability.

e) Clinical Examination

Clinical assessments conducted in nutrition surveys involve examination of physical changes that can be observed or felt in the superficial skin tissues (Austin, 1980). Tissues most frequently examined are hair, eyes, mucosa, and glands such as the thyroid.

Use of clinical examination may be a particularly valuable adjunct in the determination of nutritional status, especially in developing countries where long-term malnutrition may be a problem. The method is relatively inexpensive, can be conducted in a short time period, and does not require laboratory facilities or expensive equipment (Jelliffe, 1966).

Detection of clinical signs, however, is subjective, and observer bias may occur. Medical personnel, trained to recognize specific clinical signs, are usually required. Furthermore, clinical signs lack specificity. Clinical signs indicative of nutrient deficiencies may be similar to signs produced by physical trauma, infection, or environmental factors such as smoke, dust, and climate (Jelliffe, 1966). Finally, clinical signs are only indicative of long-term malnutrition. Subjects with marginal malnutrition will not be detected.

Use of dietary evaluation, anthropometry, clinical examination, and biochemical analyses are necessary in evaluating nutritional status of population groups. Inclusion of all four approaches is essential because no one method alone is capable of determining nutritional status.

Determination of nutritional needs for the purpose of program development may, however, require only one or two of the above methods. Use of clinical examination, for instance, may be of little value if subjects are

suffering from subclinical malnutrition. Biochemical tests are invasive methods and may be culturally unacceptable. Dietary evaluations, however, may be useful in detecting undesirable dietary practices which could eventually lead to marginal malnutrition or clinical signs. Finally, anthropometry is a non invasive method and a sensitive indicator of growth retardation in children.

4. Nutrition Intervention Strategies

Nutrition interventions may be defined as planned action(s) for the improvement of nutritional status of specific population groups (Austin and Zeitlin, 1981; Maletnlema, 1981). Interventions may be classified according to the type of activity performed, such as providing food or nutrients, treating and preventing diseases, providing knowledge, increasing income, or planning integrated community programs that include nutrition (Maletnlema, 1981).

The designing and implementation of any nutrition intervention program must consider the existing problems and needs of the target group. "Need" has been defined as the gap or imbalance existing between the actual and the desired state of affairs (Boyle, 1981; Eash, 1981).

Needs have been categorized as being "felt" or "prescribed". A "felt" need has been described as a gap or imbalance that the individual or target person regards as important, with "prescriptive" needs as those identified by persons involved in the program planning process.

Identification of needs is important so that program funds are used in the best possible manner (Eash, 1981). This may be accomplished by conducting a needs assessment which can provide reliable and valid data on the existing situation and the target group's perceived needs (Eash, 1981).

Formal approaches in conducting a needs assessment may involve the use of questionnaires, interviews, records, statistics, and other research data, and tests. Informal needs assessment may use informal discussion and personal observations (Boyle, 1981). In planning a nutrition intervention strategy, data may be obtained from infant morbidity and mortality rates, anthropometric measurements, clinical signs, dietary intake data, biochemical tests, demographic/socioeconomic information, and nutrition knowledge, attitudes, and practices.

Various nutrition intervention strategies are available, ranging from food aid, supplementary feeding programs, fortification and direct nutrient dosage, novel food sources, nutrient dense foods to nutrition education and integrated programs. Selection of an appropriate nutrition intervention strategy will depend on various factors such as the type and degree of existing nutrition problems; political philosophy; availability of economic, human, and technical resources; marketing and communication networks; and history of effectiveness.

Food aid, for instance, is probably the most effective short-term intervention for famine resulting from natural disasters, although criticisms of inadequate transportation infrastructure, administration, and pilferage have been reported (Maletnlema, 1981). Supplementary feeding programs, on the other hand, provide food supplements on a relatively

long-term basis for nutritionally vulnerable groups such as infants, school children, and pregnant women (Anderson et al., 1981). Effectiveness of supplementary feeding programs has been studied and problems of target subjects not receiving the supplement, use of inappropriate foods, high operational costs, and low participation rates have been identified (Austin, 1980; Singer, 1980; Beaton and Ghassemi, 1982). Positive outcomes from food supplementation have been reported such as increased work productivity among physical labourers, increased growth in children, and increased birth weight in supplemented pregnant women (McDonald et al., 1981; Mora et al., 1981; Wolgemuth et al., 1982; Angeleli, 1983).

Fortification and direct nutrient dosage involve the use of specific nutrients to improve nutritional quality of the diet or to provide nutrients directly to subjects (Austin, 1980). Some examples of fortification programs in developing countries are fortification of sugar with vitamin A and salt with iodine; nutrients most frequently given directly to target subjects by injection or orally are vitamin A and iron.

Use of food fortification, however, does not necessarily ensure that the most vulnerable groups receive adequate quantities of the nutrient. Furthermore, other factors such as parasitic infestation, infection, and PEM may interfere with nutrient absorption and utilization. Limitations of the direct nutrient approach are that biological availability may be low, individuals may be missed during dosage distribution, and distribution campaigns must be organized and financed on a regular basis (Austin et al., 1981).

Nutrient dense foods, designed as weaning supplements for children, contain the necessary protein and energy for growth of weanlings. Although numerous nutrient dense foods have been produced in developing countries at the industrial or local level, products may not necessarily be purchased by low income groups because of cost (Popkin and Latham, 1973; Austin, 1980; Heimendinger et al., 1981). A solution to the cost factor has been teaching women to prepare weaning foods from local ingredients in the home (Cameron and Hofvander, 1980; Heimendinger et al., 1981).

Integrated nutrition programs may include nutrition education given in conjunction with nutrient dense foods, food distribution programs, or other health-related programs such as water, sanitation, and family planning (Austin, 1980; Austin et al., 1981). The most common examples of integrated nutrition programs are the Nutritional Rehabilitation Centres (NRC), Mothercraft Centres (MC), and Under-Fives Clinics which have been established in various developing countries.

Use of MCs and NRCs is justified, however, only in populations where moderate or severe malnutrition in children exists, and not where populations primarily exhibit marginal malnutrition. Other problems associated with NRCs and MCs were high operational costs, inadequate coverage of the population, and lack of stress in educating mothers about proper child feeding and care (Beghin, 1970). In contrast, Under-Fives Clinics had a wider target group, with child care services including diagnosis, preventative and curative services for children (Gwatkin et al., 1980). Services included diagnosis and treatment of illness, immunization, regular check-ups, as well as antenatal and obstetrical care. Nutrition supplementation

and education were provided, however, only if weight gain was inadequate (Berg, 1973).

Finally, nutrition education has been used alone as a nutrition intervention strategy or as part of integrated nutrition programs. Nutrition education may be particularly useful for low socioeconomic groups because people could learn how to obtain maximum benefits from limited resources and learn how to assume greater personal responsibility for their health and nutrition (Al-Isi et al., 1975). Use of nutrition education among low socioeconomic groups in Brazil may be the most appropriate nutrition intervention strategy considering Brazil's current economic situation and political philosophy. A study by Patrick and Simoes (1971) found that nutritionally adequate diets could be achieved by low socioeconomic groups in Brazil, if income expenditures were reallocated. They recommended nutrition education as the means for achieving this purpose. The different types of nutrition education strategies available and their effectiveness will be described in greater detail in the following section.

5. Nutrition Education

a) Philosophy of Education

Education is not a static, but a dynamic process. This process may be viewed philosophically as two diametrically opposed concepts, the "banking" and "problem-solving" concepts (Freire, 1981). Freire (1981) describes the "banking" concept of education as an act of depositing information, with students as empty containers to be "filled" by the teacher. Students are

passive beings lacking creativity or critical consciousness. This view of education functions as a means of bringing about and ensuring conformity and increasing dependency (Drummond, 1977).

Education as a "problem-solving" instrument involves a two-way dialogue between teachers and students. "Problem-solving" education allows the development of creativity and the awakening of critical consciousness (Drummond, 1977; Freire, 1981). Education, in this context, allows people to think and act critically and creatively and to become self-reliant (Drummond, 1977).

In developing countries, the adoption of the "problem-solving" concept of education would result in people becoming actively involved in the developmental process and decision making. This philosophical approach is contrary and detrimental to developmental philosophies stressing only economic growth with little or no consideration for increasing or improving social services or reducing extreme inequalities in income distribution, land tenure, or other injustices.

The view nutrition educators maintain regarding education is significant in the development and implementation of nutrition intervention strategies, especially nutrition education. Drummond (1977) states that nutrition education will result in either increasing or decreasing dependency. If the nutrition educator wishes the recipients of the education program to become more self-reliant and responsible for their nutrition and health, then Freire's "problem-solving" approach to education must be seriously considered and attempted. Implementation of this educational approach is not easy. Drummond (1977) stresses that great self discipline

and patience are required by the educator, for awaiting response and verbal contribution from the target group.

b) Goals of Nutrition Education

The goal of nutrition education has frequently been viewed as the changing or modification of dietary habits and, hence, nutritional status of individuals, groups, or populations (Sevenhuysen, 1978; Jelliffe and Jelliffe, 1981). Kolasa (1981) has stated that this commonly-held view by nutrition educators implies that populations only have undesirable food habits. Other goals could involve reinforcement of desirable food habits and beliefs, presentation of nutrition information, or more efficient utilization of food resources. Berg (1973) has stated that although insufficient purchasing power may be the major factor in malnutrition, some nutritional deficiencies could be alleviated if individuals knew how to utilize available resources in the best possible manner.

According to Berg (1973) and Zeitlin and Formacion (1981), the goal of nutrition education is not only to change existing detrimental dietary behaviour, but to acquaint individuals with available food resources which could improve nutritional status. As mentioned previously, use of nutrition education may be particularly beneficial for low socioeconomic groups because people could learn how to use limited financial resources to their best advantage.

c) Considerations in Conducting Nutrition Education Programs

Several factors such as the characteristics of nutrition educators and communication process and the development of food habits and preferences should be considered in conducting nutrition education programs, especially in developing countries. Nutrition educators should possess knowledge of the target population and available resources, be aware of the target population's needs and expectations, and develop a positive attitude and relationship with the target group (Ritchie, 1970; Praun, 1982). Furthermore, nutrition educators should possess skills in educational techniques and be able to motivate and encourage participation of target subjects during education sessions (Ritchie, 1979; Praun, 1982).

An understanding of how food habits and practices are developed is also important, regardless of whether the goals of nutrition education may be to change detrimental food habits, to reinforce desirable food habits and beliefs, or in the presentation of nutrition information.

As mentioned previously, not all potentially edible foods are eaten. Society determines what foods are edible or not. Furthermore, society also defines what foods are to be sold, what foods will be consumed by the rich, poor, men, women, children, during special days and events, and during illness, to cite a few. Society's classification of foods, whether for consumption for certain age or sex groups or specific occasions, forms the food attitudes, beliefs, and taboos for each individual in the population. Any attempt to change an individual's, group's, or population's dietary behaviour, then, logically involves an encounter with societal and cultural values.

The actual process involved in the formation of dietary habits has been a subject of considerable research. Earlier opinion held that changes or increase in knowledge would cause changes in attitudes, the latter then resulting in changed behaviour or practices. Subsequent research, however, dispelled the knowledge, attitudes, practices (KAP) approach. Schwartz (1975), in studying the relationship between enrollment in high school home economics courses and nutrition knowledge, attitudes, and practices four years after graduation, found relationships between knowledge and attitudes, and between attitudes and practices. Three other models were postulated: knowledge and attitudes interact to affect practices; knowledge and attitudes independently affect practices; and knowledge could affect practices directly or indirectly through attitudes. How knowledge and attitudes may affect practices or behaviour are important considerations in nutrition education, especially if attempts to change dietary habits or behaviour are desired.

Another important consideration is the identification of persons who may be more receptive to new ideas or habits. People have been classified as innovators, early adopters, early majority, late majority, or laggards (Ritchie, 1979). Identification of early adopters would be important in nutrition education programs because they could be used to influence other members of the target group or population.

Several factors may affect the rate of adoption of a new practice or behaviour. The new practice or behaviour may be adopted if the target group views the suggested change as advantageous compared to the former practice or behaviour. Furthermore, the adoption of any new practice must

be compatible with the target group's way of life; if suggested changes are too complex or difficult, this will delay rate of adoption. Finally, rate of adoption depends on whether the new suggested behavioural change can be accepted over a series of stages or must be accepted in one stage and whether the suggested change in practice or behaviour is easily demonstrated and explained to others (Ritchie, 1979).

Identification of motivating influences or incentives for change must be seriously considered in nutrition education programs. Examples of strong incentives for change may be to improve one's status, have security, to achieve power, improve one's social standing, economic status, and to have good health (Ritchie, 1979).

The process by which new practices are accepted may be classified into several stages (Ritchie, 1979). Initial stages involve becoming aware of the new proposed change, followed by an interest in obtaining further information. The next stage is an evaluative one, in which the subject considers advantages and disadvantages of the proposed change, followed by a trial period to determine usefulness. Finally, the new habit or behaviour is either accepted or rejected.

The communication process has been defined as the transfer of ideas or information from one person to another, implying a two-way process or dialogue (Ritchie, 1979). This transferring process may occur by verbal means or non verbal means such as body expressions and tone of voice (Ritchie, 1979).

Communication consists of a communicator, message, listener, and channel. A good communicator should be able to present the message simply and clearly, be understanding, have a pleasant personality, and be able to listen and to inspire confidence (Ritchie, 1979). The message should be culturally relevant and not open to misinterpretation. Understanding and acceptance of the message by the recipient will depend on the recipient's current knowledge, attitudes, and communication skill (Ritchie, 1979.)

In nutrition education, the message must be useful and practical, suggesting changes that are acceptable, minimal, and relevant to local needs and situation. New foods or dietary practices to be introduced should be closely related to traditional habits (Jelliffe, 1966; Sevenhuyzen, 1978; Morse, 1978; Austin, 1980; Ritchie, 1979; Jelliffe and Jelliffe, 1981).

Channels which may be used to transmit the message to recipients or the target audience may involve various educational methods, techniques, and devices. Educational methods may include didactic methods such as lectures, speeches, and mass media; learner-participatory methods such as group discussion/decision meetings; demonstrations; role playing; and drama (Ritchie, 1979).

Types of channels used will depend on the type of education philosophy adopted by the educator. General opinion holds that behavioural changes are more likely to occur if learner-participatory methods such as group discussions are used, whereas didactic methods may be most appropriate when used in conjunction with more personal methods (Ritchie, 1979; Whitehead, 1973, as reported by Fieldhouse, 1982).

Devices used to convey the message to the target audience must also be appropriate for the situation and the type of audience (Berg, 1973; Austin, 1980). A variety of media and materials may be used such as radio, television, video, films, posters, signs on local transport, pamphlets, newspaper, filmstrips, flannelgraph, flip charts, and puppets, to cite a few (Berg, 1973; Ritchie, 1979; Austin, 1980).

Zeitlin and Formacion (1981) have suggested that a combination of mass media and face-to-face methods might be more effective because different phases of the learning process are more amenable to different media approaches. To arouse interest, radio spots, posters, or free samples may be most effective. Initial instruction and motivation for trial, the next two phases of the learning process, may best be served using radio spots and radio testimonials. Finally, practice and repeated trials may be achieved using demonstrations and trials by women's groups.

d) Types and Effectiveness of Nutrition Education Strategies

Two main types of nutrition education strategies are mass media and face-to-face methods. Use of mass media such as radio, television, video, and newspapers have often been ignored in nutrition education. Mass media, appropriately used, however, can play a major role in changing food consumption patterns such as results obtained from carbonated beverage advertisements. In developing countries, important factors such as literacy of target audiences, types of cultural groups and number of language groups must be considered (Berg, 1973).

The main advantage of mass media is that a larger population area may be reached more quickly and at a lower cost (Berg, 1973; Austin, 1980). Furthermore, fewer personnel are required than for face-to-face methods, message is produced at a central location and is the same for the entire audience, method is relatively inexpensive, and the method can be effective in arousing interest, increasing awareness and knowledge (Berg, 1973; Austin, 1980; Yarbrough, 1983).

Several limitations and disadvantages exist. Although fewer personnel are required than for face-to-face methods, personnel require greater skills. In addition, the message should only express one idea, be concise, relatively simple, easily understood, remembered, and persuasive (Yarbrough, 1981).

Several studies have been conducted to determine the effectiveness of mass media in nutrition education programs. Chicci and Guthrie (1982) studied the effect of a 37 day radio nutrition campaign on nutrition knowledge for three groups: residents of a university town, university students, and rural residents. Results indicated improved nutrition knowledge scores in all groups, with the exception of rural residents.

Cerquira et al. (1979) compared the effectiveness of mass media (posters, pamphlets, radio) techniques in nutrition education with a direct method (lectures) in a three month study in three rural Mexican communities. Results indicated that nutrition concepts were learned equally well by both groups as compared to the control group.

Face-to-face communication methods may include group discussion/decision workshops, demonstrations, drama, role playing, and individual or group teaching (Ritchie, 1979). Compared to the mass media approach, face-to-face techniques have a limited outreach (Berg, 1973).

A few studies have been conducted to evaluate the effectiveness of face-to-face methods with other approaches. Johnson et al. (1984) studied the effectiveness of three education strategies to improve chances of breast feeding success in Texan post partum mothers. Education strategies used were a referral card announcing breast feeding consultation services; referral card and manual describing how to solve common breast feeding problems; and a referral card, manual, and one bedside teaching session. Results reported that the group of mothers receiving a bedside teaching session had a statistically significant percentage increase in the continuation of breast feeding than was observed by using other education strategies.

Wright et al. (1982) attempted to increase use of soybeans among low income Brazilian families, using either a direct educational approach or a group discussion/decision method. Although an appropriate control group was lacking, results indicated that more women in the discussion/decision group used soybeans than in the direct education group.

Drummond (1975) conducted a three month nutrition education program in northeastern Brazil using Freire's "problem-solving" approach. The purpose of the study was to determine whether community meetings about nutrition would make illiterate persons aware of the malnutrition problem, be motivated to want to alleviate the problem, and work together as a community to

solve the problem. Four rural settlements, alike in size and conditions, were selected for the study. Community meetings were held and several nutrition topics were discussed. Although the time period for the study was considered too short to measure changes, attendance at meetings was high, participants were enthusiastic and willing to become involved in discussions.

6. Program Evaluation

Evaluation has been broadly defined by Hennigan et al. (1979) as the process of obtaining information about program operations and the final outcome of implemented programs. Evaluation may simply be regarded as a feed-back mechanism in determining how successfully programs objectives were met or as a means of judging the value of a program (Boyle, 1981; Cordera and Bobenrieth, 1981; Church, 1983). Obtaining information about program operations has become known as "process" or "formative" evaluation, with investigation about final outcome named "impact" or "summative" evaluation.

The purpose of evaluation is to determine whether a program is effective or not, and if effective, the magnitude of effectiveness. Another reason for conducting evaluations is to demonstrate cost effectiveness (Lane, 1981). Schurch (1983) states that evaluations are necessary, particularly when resources are limited, because it allows decision makers to utilize resources in the most efficient manner.

Many nutrition programs in the past have not been evaluated. Little knowledge, therefore, exist as to what results or impact have occurred, even though much dedication, time, human and financial resources have been invested in the program (Schurch, 1983). Furthermore, the program designer and implementor have no definite information regarding how and where certain changes could be made (Schurch, 1983). Program errors, as a result, could recur again and again (Schurch, 1983).

Nutrition programs have tended to ignore formative evaluation, placing more emphasis, instead, on the final outcome of program operations (Gillespie, 1981). King (1983) described formative evaluation as the means for identifying limitations, errors, and operational flaws. Formative evaluation is also used to determine whether program implementation is occurring according to the original plan and to assess the quality of the instructional process (Townsend, et al., 1979; Cordera and Bobenrieth, 1981). Information obtained from this evaluative process should subsequently be used in making necessary improvements.

Summative or impact evaluation measures the extent to which program goals and objectives have been achieved (Hennigan et al., 1979; Townsend et al., 1979). The final evaluation, in addition to measuring whether a change has occurred and the magnitude of the change, also attempts to attribute observed changes as being directly related to the program itself (Drake, et al., 1980).

Determination of changes that have occurred and measurement of their extent involve the use of criteria. Information gathered on program outcome is compared to criteria that have been previously established

regarding desired program outcomes (Steele, 1970 as reported by Boyle, 1981). This process depends on objectives that have been carefully formulated prior to program implementation (Cordera and Bobenrieth, 1981). Objectives should, therefore, be specific and meaningful.

Evaluations, whether formative or summative, may be conducted either in an informal or formal manner. Examples of informal methods are visits of the program site by evaluators; interviews with staff, program administrators, and participants; and reviewing program materials and records (Austin and Zeitlin, 1981). Informal methods have been recommended for pilot projects in operation for only a short time period or for small projects (Austin and Zeitlin, 1981). Formal methods are more complex and comprehensive in nature, and statistical methods are included. This approach is useful with programs involving a large target group (Austin and Zeitlin, 1981).

Controversy exists as to whether all programs require evaluation. Stanfield (1983), for instance, claims "evaluation is an inherent part of all planned activities." Cook and McAnany (1979), on the other hand, state programs need not be evaluated when previous studies demonstrate the program or intervention will be effective; when individuals exhibit a need, and the necessary and appropriate resources exist; or when programs have been operational for a short period of time. They maintain that many evaluations have been conducted on new programs when operational errors and administrative difficulties were still common.

Cook and McAnany (1979) indicate that summative evaluation should be conducted, especially in situations where resources are limited and

programs, therefore, have to be selected with care. Furthermore, they suggest that evaluations should be conducted after the program has passed the initial trial period and is at the point where implementation on a wider scale is contemplated. The optimum time to conduct summative evaluations, however, would depend on the particular project and situation.

Conducting evaluations of nutrition programs may be complex and difficult, requiring the resources of time, money, and personnel (Lane, 1981). Furthermore, ethical considerations may prevent the utilization of optimum study design, such as experimental and control groups (Lane, 1981). Decisions must be made as to what programs to evaluate, who will conduct the evaluation, and the use of appropriate indicators to measure the implementation process or program impact.

Finally, several program characteristics may be evaluated. These include program quality (content, media, activities, instructor), program suitability in meeting the needs and expectations of the target group, program effectiveness, and program efficiency in terms of maximum efficient use of program resources (Boyle, 1981).

Determination of whether changes have occurred as a result of program implementation is accomplished by using indicators to measure the degree of change. Indicators must be selected that will be appropriate, valid, reproducible, relatively easy to collect and interpret, be as objective and specific as possible, and be numerically measurable (Latham, 1972). Other factors affecting choice of indicators are whether evaluation is conducted at an individual or a community level, ethics, cultural appropriateness, and program type (Habicht and Butz, 1979; Austin and Zeitlin, 1981).

Useful indicators in nutrition programs may be mortality and morbidity rates, anthropometric measurements, clinical signs, and biochemical assessment (Austin and Zeitlin, 1981). Nutrition education programs might use evidence from knowledge, attitudinal, or behavioural changes to determine program effectiveness. During formative evaluation, indicators such as attendance rates, number of services or messages delivered to the target group, amount of coverage of the target group, attrition rates, and leakages (services reaching persons other than the target group) could be selected (Austin and Zeitlin, 1981).

Hoorweg (1983) mentions that evaluators should recognize and attempt to control any confounding factors which could influence program outcome. Examples of potential confounding factors are environmental changes (economic, social, political, and physical), changes in population age, changes in the target population (death, immigration, and emigration), age of the program or project (changes that may occur in enthusiasm and skills of program staff, and changes in program resources), changes in selection of target group (volunteer participants, convenience for the program planner, religious affiliation, or caste), changes in data reliability (data gathering techniques may become less accurate with time), and Hawthorne effects (Drake et al., 1980).

In conducting summative evaluation, evaluators must recognize the most appropriate time in determining program outcome. If evaluation is conducted shortly after program implementation, no change may be observable. If evaluation, on the other hand, is conducted a long time after program implementation, the greater the risk that confounding factors may have

influenced the final program outcome.

Evaluations may be conducted internally by personnel working within the program or externally by personnel not affiliated with the program. Stanfield (1983) and Latham (1972) favour the use of primary health care personnel in the evaluation of programs such as nutrition education. Advantages in using primary health care workers are that workers have more personal contact with the program compared to external evaluators, evaluation conducted by primary health care workers would be continuous as compared to a "once-only" basis by external sources, evaluations conducted by outside sources might be invasive and a disruptive influence in the community and among local personnel, and finally, internal evaluation could provide a motivating influence for primary health care workers.

The major problem associated with internal evaluation, however, is that bias could occur in favour of program success (Townsend et al., 1979; Stanfield, 1983). Furthermore, program failure could result in causing feelings of inadequacy and lack of self confidence among workers.

Several factors should be considered when selecting whether internal or external evaluators will be used. These factors include availability of financial resources, skills and potential bias of program staff in collecting evaluation data, and the disruptive influence that external evaluators might exert on the community, program staff, and participants.

Finally, several other factors and potential problems such as ethics, language, sample selection, confounding variables, politics, and the quality and availability of data processing facilities must be considered when conducting evaluations (Townsend et al., 1979). Language and cross

cultural differences may pose problems for evaluators, especially if evaluators live outside the cultural group under investigation (Townsend et al., 1979). Furthermore, indicators selected to measure program effectiveness must be culturally appropriate.

Relationships between program staff and evaluators are important, especially if evaluators are outsiders and not directly associated with the program. Program staff could consider external evaluators as a personal threat; the target audience could view outside evaluators with suspicion and resentment (Latham, 1972).

Politics and ethics must be considered. Evaluation is a political issue because results could potentially be contrary to the views of the funding organization, government, or even the participating community (Townsend et al., 1979). Ethics must be considered to ensure participant privacy and confidentiality of information (Townsend et al., 1979).

Finally, efforts must be made to determine whether unexpected benefits or undesirable outcomes have occurred as a result of the program. Furthermore, not all programs are successful. If failures occur, attempts should be made to determine the cause in order that future programs could be improved.

CHAPTER III

METHODS AND MATERIALS

1. Design of the Study

A nutritional needs assessment was conducted among Brazilian women and children less than 5 years of age from a low socioeconomic level. The target group in this study were female heads of households living in a favela (slum) on the periphery of Nuporanga, a rural settlement in Sao Paulo state, Brazil.

An appropriate nutrition education program for the target group was designed on the basis of information obtained from a nutritional needs assessment. The assessment was conducted among the target group and children under 5 years of age, using dietary assessment, nutrition knowledge, beliefs/attitudes questionnaires, and anthropometry.

Formative and summative evaluations of the nutrition education program were conducted, using appropriately selected criteria and comparing nutrition knowledge scores before and after the program.

2. Study Location

a) Nuporanga

The study was conducted in Nuporanga, a rural settlement located in northeastern Sao Paulo state and connected by highway with the cities of

Ribeirao Preto and Sao Paulo, a distance of 80 and 400 km, respectively. Nuporanga, with an estimated population of 5,000, was situated in the heart of a rich farming region. Types of farms included cattle, coffee, poultry, sugar cane, cotton, rice and soybeans.

Nuporanga was one of the most picturesque and well-kept villages of the region. Houses reflected architecture of recent times coexisting with older homes constructed in the Portuguese style; brightly painted and accented with colourful tiles and houseplants. Approximately 100 low-cost houses were located on the outskirts of the village. Two favelas, Vila Nova, consisting of about 15 families and Vila Diogo, with more than 70 families, were situated on the periphery of Nuporanga.

Nuporanga had a variety of businesses and services. Local industries in the area included a chicken hatchery, abattoir, and a milk collection depot. Examples of small cottage industries were dress-making, basket weaving, broom-making, and metal work.

Health services available were an 18-bed hospital without surgical facilities, 2 doctors, several dentists, and 1 state Public Health Post. The Health Post offered immunizations, prenatal classes, and other infant-related services such as free milk distribution to infants in need.

Education facilities included a primary and secondary school, and a preschool operated on a fee basis. A second preschool or daycare-type centre offered playground facilities, a small lunch, and bath to young children at no cost.

Types of recreational facilities and entertainment available were a public swimming pool, week-end soccer games, pinball arcade, and games in

some of the bars. A private club offered limited game facilities and a monthly dance.

Because many residents did not have private telephones, public phones were located on the main street. A public address system announced funerals and deaths, as well as playing recorded music during the evening.

Walking was the most popular transportation mode within the village. Cars, trucks, and bicycles were common, with farmers frequently using horse or horse and cart.

Nuporanga's water supply was obtained from artesian wells, and piped into individual homes. Some homes used clay water filters as no centralized water treatment existed. Water costs doubled and charges for other town services tripled in cost when the new mayor assumed office in February, 1983.

b) Vila Diogo

Vila Diogo was located on the periphery of Nuporanga, approximately a 15 minute walk from the village centre. The favela was bordered on one side by a small coffee farm and a major road leading to a nearby city on the other side.

Houses were situated on both sides of an earthen street, with 20 and 56 houses on each side, respectively. At the beginning of the favela, houses were located in close proximity to each other (Figure 3), becoming more widely spaced towards the end of the favela.

All houses in Vila Diogo were personally owned. Houses were generally small, with 3.5 as the average number of rooms. Natural lighting and



Figure 3. A partial view of Vila Diogo. Photo courtesy of Dr. I.D. Desai.

ventilation in houses were poor due to lack of windows. Windows in most homes were open with wooden shutters. Roofs were made of tiles, most walls were constructed from cement, and floors were either packed earth or concrete.

Electricity and piped-in water were obtained from Nuporanga sources. Of all households interviewed, 62.% had electricity; 71.4% of households had piped-in water, with 25.0% obtaining water from favela wells.

In contrast to Nuporanga, the environment in Vila Diogo was unhygienic. Sanitation in Vila Diogo was poor, with open gutters used as a sewage disposal system. Furthermore, 82.2% of respondents used open gutters and yards for toilet facilities. A large percentage of respondents (61.4%) disposed garbage openly on the street or yard. Another factor contributing to an unhygienic environment was that almost two-thirds of households owned dogs, cats, birds, chickens, or hogs.

Most residents commuted to Nuporanga by walking, with only one or two men owning bicycles. Men and women working as agricultural labourers were transported to and from location by large trucks.

3. Study Population

a) Survey Procedure

The study population consisted of 76 families living in the favela of Vila Diogo (Figure 3). Factors considered in the selection of this population were that the favela was well-established, favela was situated on the periphery of a rural settlement, and an English-speaking doctor was

practising in the community.

Initial contact with Vila Diogo residents was made with the assistance of one of the local doctors. Research personnel were introduced to one of the oldest women residents, who subsequently acted as a liaison between the residents and research personnel.

All families living in Vila Diogo were visited on an individual basis by research personnel and local interviewers. Names and birthdates of individual family members were identified and recorded. Birthdates of residents, if unknown, were obtained from hospital records. The purpose of the study was explained and written or verbal consent was obtained from women (target group) who agreed to participate (Appendix A). Permission to involve children under the age of 5 years was obtained from the parents or guardian (Appendix A). Participants were assured of confidentiality of information and the freedom to withdraw from the study at any time.

Of the 76 families living in Vila Diogo, 71 female household heads were approached to participate in the study. The remaining 5 households consisted of female household heads who were mentally incompetent or households which were headed solely by males. Fifty-six women (78.9%) consented to participate in additional interviews, using questionnaires. During the study, nine women, who originally had consented to participate, were no longer able to continue (n=47). All women who consented to participate in the study were personally interviewed by local interviewers using the following questionnaires: Demographic/Socioeconomic/Food Habits/Health Related Practices, 24-Hour Food Recall, Food Frequency, Food Preferences,

Infant Feeding Practices, Nutrition Knowledge, and Nutrition Attitudes/Beliefs (Appendices B to H).

The 24-Hour Food Recall, Food Frequency and Food Preferences Questionnaires used in this study had been developed, pre-tested and administered in previous Brazilian agricultural migrant studies; the Demographic/Socio-economic/Food Habits/Health Related Practices Questionnaire, previously used in other agricultural migrant studies was modified for the present study. Nutrition Knowledge and Nutrition Attitudes/Beliefs Questionnaires were developed for this study, translated into Portuguese, and pre-tested in Brazil. Questionnaires were administered by personal interview and conducted in Portuguese by two local teachers, who had been trained by research personnel. All interviews were supervised by the primary investigator who had a basic knowledge of the local language.

b) Demographic and Socioeconomic Information,
Food and Health Related Practices

Seventy-six households were enumerated, with a total population of 352. Almost one-quarter of all households (23.2%) were headed solely by women, compared to 7.0% for men.

Age distribution was highly skewed, with more than one-half of the population (59.5%) 20 years of age or less, and few old people. Household size appeared large, with 47.3% and 7.9% of all households reporting more than 4 and 8 persons per household, respectively.

Other demographic and socioeconomic information is reported in Table 1. Although literacy rate and education level among residents were low, a larger proportion of male household heads compared to females reported receiving formal education and being able to read and write. Years of formal education were low, with most residents not reporting more than four years. Furthermore, years of schooling reported may have included repeated grades. Reasons most frequently cited by mothers for children's poor school attendance records were that children disliked school (35.7%) and children were working, either because of personal preference or for economic reasons (28.6%).

For women who consented to participate in the study, a mean residency of 6.3 years in the present home was reported. Only a small percentage of respondents (14.2%) had migrated from other towns, states, or cities. A significant number of women (25.0%) were born and raised in Vila Diogo or had lived in another house in the same favela; 28.6% and 25.0% of respondents had previously lived in Nuporanga and fazendas, respectively. Reasons most frequently cited for moving to the Nuporanga district were to earn more money and to obtain better medical services.

Reported unemployment rates one week prior to interview were negligible, probably because agricultural work was nearing peak levels. Additional evidence, however, indicated that for women and children normally employed, significant numbers (18.2 and 10.8%, respectively) had different jobs between the time period of one month and one week prior to the survey.

TABLE 1

Demographic and socioeconomic characteristics of the study population ^a

	<u>Household Heads</u>		
	Male	Female	Children
Ability to read and write	61.3	42.3	----
Formal education			
None	33.9	45.0	----
<1-4 years	64.6	52.2	----
Children currently attending school	----	----	43.4
Employment rate ^b	97.5	100.0	97.3
Occupation ^c			
Agricultural labourer	70.0	72.7	62.2
Domestic	0	9.1	10.8
Other ^d	27.5	0	16.2
Estimated weekly income ^e			
Agricultural labourer	11.01- 27.53	11.01- 27.53	11.01- 27.53
Domestic	----	----	3.28- 4.59
Other ^d	5.24- 27.53	----	----

^a All values expressed as percent of total responses, unless otherwise noted.

^b Employment rate one week prior to interview for persons normally employed.

^c Type of employment one month prior to interview.

^d Garbage collector, tractor operator, brick layer, making brooms, weeding gardens, mechanics' assistants, working in abattoir.

^e Values expressed as US dollars.

Majority of households (62.5%) consisted of one wage earner supporting an average of 4.1 persons. As number of wage earners per household increased, mean number of household members generally increased.

Small cottage industries such as broom-making, basket weaving, shoe repairs, and soap-making for home use existed in the favela. Majority of men, women, and children who were employed, however, worked as agricultural labourers, with earnings varying widely, depending on the quantity of work performed (influenced by the individual's stamina, motivation, and health) as well as the weather. Wages for most occupations were below Brazilian minimum wage guidelines of \$15.45 per week (US).

Recreational facilities in Vila Diogo were lacking, although men and boys used the street to play a game resembling horsehoes or a nearby field to play soccer. Men generally spent a good deal of leisure time in local village bars. Activities women most frequently reported when not working, were visiting friends or family, sleeping, or resting. Young children played on the street with limited available toys.

Although voting is compulsory in Brazil, only about one-third of women voted in the November 1982 elections for municipal, state, and federal representatives, compared to two-thirds of men. Reasons most frequently given for not voting were the inability to read and write, and not having the necessary documents (i.e. identity card).

Dental health among favela residents was poor. Although free dental services were available, services were not used. Favela residents were also not charged for physician's services and women received free oral contraceptives. Local hospital and state Public Health Post services were

frequently used. Approximately 95% of favela children, for example, were reported immunized against communicable diseases (personal communication). Diseases such as malaria and Chaga's were no longer prevalent in the area. Common health problems reported for Vila Diogo children were respiratory infections and worm infestation, especially round worm and hookworm (personal communication).

A large percentage of men (75.0%) compared to women (44.6%) were reported smokers, with the majority smoking 10 cigarettes or less per day. Although some young children smoked, accurate information regarding children's smoking habits was difficult to obtain from mothers.

Alcohol consumption among men appeared excessive. Women generally reported a dislike of alcoholic beverages, although a few women reported consuming alcohol on an infrequent basis.

An investigation of women's reproductive history revealed a mean age of menstruation of 13.3 years (range 10-17 years), with mean age at first pregnancy (mean 20.2 years; range 14-37 years) occurring significantly later. Percentage of women reporting spontaneous abortions, stillbirths, and infant deaths was high (33.9, 10.7, and 25.0%, respectively), with a mean of 2.3 (range 1-8), 1.3 (range 1-2), and 1.5 (range 1-4), respectively.

At the time of the study, only 9% of women interviewed were pregnant or lactating. Of women who were not pregnant, a large percentage (46.4%) practised contraception, despite 84% of women indicating Roman Catholicism as their religion. Oral contraceptives were the most popular family planning method, accounting for 69.2% of all responses. Menopause, post

menopausal age, living alone, and being widowed were reasons most frequently cited for women not practising contraception; religion was not a major factor. Mean birth interval, calculated for families with more than one child (less than 5 years old), was relatively large at 2.3 years.

In an attempt to determine desired family size, women were asked what family size they would currently consider appropriate for people like themselves. Almost one-half of respondents indicated a similar family size to their own, with almost one-third of respondents stating that a larger family size than their own would be recommended.

Regarding food-related practices, majority of respondents (80.4%) reported growing some vegetables and/or having fruit trees on their property, with onion, chayote, manioc, okra, oranges, bananas, limao, and papaya as the most commonly grown vegetables and fruit. Food preservation was not generally practised, except for occasional drying of coffee beans.

Food supplies were almost totally purchased at Nuporanga supermarkets, usually on a once a week basis. Purchases were made almost equally by male and female household heads and transported to the homes by truck or van.

Meals were usually prepared by women using cooking facilities inside the house, with 80% of respondents using gas or a combination of gas and wood as cooking fuel. Although wood as cooking fuel was obtained at no charge, costs of cooking gas increased significantly, doubling in price during the study period.

More than one-half of respondents (57.1%), who had previously lived in other areas, reported changes in dietary patterns when moving to Vila Diogo. Milk was the most frequently mentioned food consumed by respondents

at their former residence, but not in Vila Diogo because of the cost. Vegetables and meat (including organ meat) were foods currently consumed in Vila Diogo, but which had not been readily available and, therefore, not generally consumed at their former residence.

In summary, residents of Vila Diogo were a relatively well-established population living at or below poverty levels, and having a low literacy rate and education level. Furthermore, their physical environment was unhygienic and a contributing factor to health problems, especially among young children. Considering the described socioeconomic characteristics of Vila Diogo residents, nutritional problems, especially in young children, would be expected.

Vila Diogo women recognized their poor socioeconomic situation and were anxious to improve their property and financial condition. Supporting evidence was obtained from responses on how women would use money if they won the lottery. Majority of women indicated that houses would be improved or better houses constructed, and money would be deposited in the bank. Furthermore, almost one-third (29.1%) of women thought food intakes were inadequate and stated that they would purchase food in larger quantities. Only a small percentage of respondents (10.7%) stated they would purchase empty energy foods such as sweets and carbonated beverages.

Although most respondents enjoyed living in Vila Diogo, several improvements for the favela such as installation of a sewage system, an improved street, and piped-in water and electricity for all homes were suggested.

4. Nutritional Assessment

a) Dietary Analyses

The 24-hour food intake of all children aged 2 to 5 years and women participating in the study was obtained by personal interview with the female head of the household, using a 24-Hour Food Recall Questionnaire (Appendix C). Quantities were expressed in Brazilian household measures: colher de cha (teaspoon), colher de sopa (soup spoon), espumadeira (slotted spoon), concha (ladle), copo (glass), xicara de cha (tea cup), xicara de cafe (coffee cup), prato (plate) (Figure 4).

All 24-hour food intake interviews were conducted by one trained interviewer to maintain a degree of conformity in the interviewing procedure. Interviews were conducted during week days to determine intake during the week as well as Sunday, a day when food intake tended to vary.

Food preferences, frequency of food intake, and nutrition knowledge and attitudes and beliefs of women participating in the study were obtained by personal interview with the aid of the following questionnaires: Food Preferences, Food Frequency, Nutrition Knowledge, and Nutrition Attitudes/Beliefs (Appendices D, E, G, H).

Infant feeding practices of children under 2 years of age was determined by personal interview with the mother using the Infant Feeding Practices Questionnaire (Appendix F).



Figure 4. Brazilian household measures. Photo courtesy Dr. I.D. Desai.

Left to right (front row): glass (copo)
tea cup (xicara de cha)
coffee cup (xicara de cafe)

(back row): plate (prato)
teaspoon (colher de cha)
soup spoon (colher de sopa)
small ladle (concha pequena)
medium-size ladle (concha media)
slotted spoon (espumadeira)

b) Anthropometric Measurements

Participants were invited to attend anthropometric measurement sessions which were conducted in one of the favela homes. Initial anthropometric measurements included height, weight, head circumference, triceps skinfold (TSF) thickness, and mid-upper-arm circumference (MUAC). Subsequent monthly height and weight measurements for children (under 5 years) participating in the study were obtained for a three month period, with results plotted individually on growth charts. One copy of the growth chart was given to hospital records; the second copy was given to the mother.

Anthropometric measurements were conducted by the primary investigator according to the methods described by Jelliffe (1966). All measurements were obtained in the morning before the first main meal.

1) Weight

Subjects (women and children under 5 years) were weighed without shoes and wearing minimal clothing. No weight allowances were made for clothing. The balance, a single beam platform model was calibrated prior to each weighing session. All weighings were read to the nearest 0.1 kg. Weights of infants and toddlers were determined by subtracting the weight of the mother from the total weight of the mother and infant.

2) Height

The height of all subjects greater than 100 cm was determined, using a telescopic vertical measuring rod attached to the single beam platform

balance. Subjects were asked to remove shoes and stand erect with the back of the head touching the upright measuring rod and with the head held in the Frankfort plane. Measurements were recorded to the nearest 0.5 cm.

Crown to heel length of infants was determined by means of a recumbent length board, according to the method described by Jelliffe (1966). Measurements were read to the nearest 0.1 cm.

Heights of children less than 100 cm were determined with the aid of the recumbent length board located in a vertical position. Measurements were read to the nearest 0.1 cm.

3) Head Circumference

Measurement of head circumference was determined for children 2 years of age or less. A flexible tape was placed firmly around the frontal bones, passing the tape around the head above the ears and over the maximal prominence at the back of the head (Jelliffe, 1966). Measurements were read to the nearest 0.1 cm.

4) Mid-Upper-Arm Circumference (MUAC)

The MUAC of all subjects was determined with the aid of a flexible, plasticized tape. The tape was placed snugly around a freely-hanging left arm at a point halfway between the acromion and olecranon. Measurements were read to the nearest 0.1 cm.

5) Triceps Skinfold (TSF) Thickness

TSF thickness was measured in all subjects with the aid of a Lange caliper which exerted a constant pressure of 10 g/mm². The measurement was obtained with the left arm hanging in a relaxed position and at the site used for the measurement of the MUAC, as described by Jelliffe (1966). An average of three individual readings was recorded to the nearest 0.1 mm.

6) Mid-Upper-Arm Muscle Circumference (MUAMC)

Using values obtained for MUAC and TSF, the MUAMC was calculated according to the following formula (Jelliffe, 1966):

$$\text{MUAMC} = \text{MUAC} - \pi \times \text{TSF}.$$

Anthropometric measurements were compared to national (Marcondes', 1968) and international (National Centre for Health Statistics (NCHS), 1979) standards.

5. Nutrition Education Intervention Program

a) Development and Implementation

Results obtained from demographic and socioeconomic questionnaire and nutritional needs assessment confirmed that design and implementation of a nutrition education program was considered the most appropriate nutrition intervention strategy. Six topics selected for the nutrition education program were: Importance of Foods for Better Health, Measuring and Monitoring Growth and Nutrition of Children, Breast Feeding, Feeding Young Children for Better Health, Nutrition of the Mother, and Socioeconomic

Aspects about Food. Individual lessons were adapted from "Guidelines for Training Community Health Workers in Nutrition" (WHO Publication Number 59) and "Nutrition for Developing Countries" (King et al., 1972) (Appendix I). Although this nutrition education material had been prepared for use in developing countries, lessons had not been previously used nor pre-tested in Brazil (to the author's knowledge).

Anticipated barriers to participation in the nutrition education program were lack of interest and motivation; weather (too hot, rain), or if weather was nice, potential participants could be working in the fields or visiting in the village; disruption of household routine, participants could think they were unable or too old to learn, some participants could be mentally incompetent; illness; participants could be cautious or suspicious; children could prevent some potential participants from attending; families and friends could be resentful or jealous; lack of energy and stamina; politics within the favela.

Possible motivating factors for participation in the nutrition education program could include curiosity, desire for social interaction, to have a change from the household environment, or desire to improve the family's welfare.

A group discussion with the two local interviewers, local doctor, and research personnel was held to determine duration of the nutrition education program, length of individual sessions, number of sessions per week, and location.

All women who had consented to participate in the study were approached on an individual basis and informed of the nutrition education program. Women were asked to state their preference for day of the week and time of day for the program. Three afternoons per week (Tuesdays, Thursdays, and Saturdays) were initially selected on the basis of the anticipated number of participants and the week days women considered most convenient.

Vila Diogo was selected as the site for the nutrition education program. Selection of Vila Diogo as opposed to a site in the village was based on the following considerations: temperature - if hot, women might be reluctant to walk to the village; distance; convenience for women with small children - children could be brought to the sessions; participant's familiarity with the environment.

Three women in Vila Diogo granted permission to use their yards or homes as sites for the nutrition education sessions. Criteria used to select locations included women's interest and enthusiasm in the study, physical size of the yard or home, and location of the site with respect to easy accessibility for most potential participants.

A 10 week time period was selected for conducting the nutrition education program, allowing two weeks for most nutrition topics. One hour, considered the maximum time for each session, was based on the high probability of a short attention span in women, hot weather, potential disruption by young children, and the need to minimize disruption of women's household routines. A snack at the conclusion of each session was planned to allow further social interaction and to provide an incentive for future

attendance.

Factors considered in the presentation of the nutrition topics were: topic should be presented at a basic level of knowledge, topics should be presented in an informal manner with as many simple illustrations as possible, vocabulary used should be easily understood by the audience, concepts presented should be reinforced by repetition, and active participation from the audience should be encouraged by questioning participants and by informal discussion.

Two local interviewers were selected as instructors for the nutrition education program, based on the following factors: interviewers had pleasing personalities and had already established rapport with participants in the study, the interviewers were local village residents, interviewers had teaching experience, and one of the interviewers had a background in the health sciences.

Approximately one week prior to each nutrition education session, a meeting was held between instructors and research personnel. The content of each lesson was discussed, any questions answered, and suggestions for improving subsequent sessions were made.

One day prior to the first nutrition education session, instructors and primary investigator personally contacted all participants in the study and invited participants to attend. Subjects were informed of the number of nutrition education sessions per week, length of each session, and location.

b) Evaluation

Types of evaluation conducted were formative and summative, with formative evaluation used as a basis for improvements or changes in subsequent nutrition education sessions. Written evaluations by instructors and primary investigator were completed at the end of each nutrition education session using specified guidelines (Appendices J, K).

Summative evaluation, conducted on completion of the nutrition education program, consisted of written evaluations by instructors and primary investigator using suggested guidelines (Appendix L). In addition, program participants completed the Nutrition Knowledge Questionnaire (Appendix G) to determine whether any changes in nutrition knowledge had occurred as a result of the education program.

6. Data Analyses

Computer programs, developed by Lewis James, formerly of the Faculty of Arts Computing Centre, were used for nutrient analysis. Estimated daily nutrient intakes and percentage contribution of food groups to nutrient intake were determined for Vila Diogo women and children, age 2 to 5 years.

Wilcoxon signed rank test was used to determine whether differences in women's nutrition knowledge scores were statistically significant at $\alpha = .05$ and $\alpha = .01$.

CHAPTER IV

RESULTS

Results are presented in four categories: dietary assessment which includes infant feeding practices, women's food preferences and frequency of food intake, and 24-hour food intakes of women and children (2 to 5 years); anthropometric assessment of women and children (less than 5 years); nutrition knowledge, attitudes, and beliefs of women; and evaluation of the nutrition education program.

1. Nutritional Assessment

a) Dietary Assessement

1) Infant Feeding Practices

Age at which children (less than 5 years of age) were weaned is reported in Table 2. Although all children had been breast fed at birth, duration of breast feeding was relatively short, with majority of infants no longer breast feeding at 6 months of age. Sudden weaning was reported by numerous women (47.6%), with fewer women (38.2%) reporting gradual weaning practices. Women generally used a more expensive product such as powdered whole milk, rather than diluted cow's milk as a breast milk supplement or substitute.

Age at introduction of various liquids (other than milk), semi-solid, and solid foods, reported in Table 3, shows that tea (herb tea with sugar)

and coffee (with sugar) were the most common beverages given to infants. By 6 months of age, most infants were consuming tea (herb tea with sugar) and about one-half of infants were drinking coffee (with sugar). Fruit juices (with sugar) were popular and were generally introduced during 1 to 3 months of age. Although recommended infant feeding practices indicate milk alone is sufficient for infants up to 3 to 4 months of age, a small percentage of infants were given solids such as bread, fruit, vegetables, rice, beans, egg, meat, or regular family food early in life (1 to 3 months of age). Furthermore, by 6 months of age, one-third of infants were already eating the regular adult diet.

Results of infant feeding practices during illness (Table 4) found many practices to be nutritionally detrimental. Many infants were fed differently when ill, especially during fever and diarrhea. When infants had diarrhea, a large proportion were not given anything to eat nor drink, and were given laxatives; during fever, a large percentage of infants were only given liquids. Mothers, however, generally did not feed infants differently during other illnesses.

2) Food Preferences of Women

Female heads of households (n=47) were asked to state their degree of preference of numerous food items. The most popular food item for each degree of preference is recorded in Table 5.

A unanimous preference was noted for many vegetables, including the yellow and dark green types. Egg plant, which was commonly available, was disliked by a significant percentage of respondents. Beans (legume group)

TABLE 2

Distribution of weaning age by children less than 5 years

Age groups	n	%	Cumulative %
Up to 2 weeks ^a	3	15.8	15.8
2 - 3 weeks	1	5.3	21.1
1 - 3 months	8	42.0	63.1
4 - 6	2	10.5	73.6
7 - 9	3	15.8	89.4
10 - 12	1	5.3	94.7
1 - 1 1/2 years	1	5.3	100.0
	19	100.0	

^a All infants were breast fed at birth.

TABLE 3

Age at introduction of liquid, semi-solid, and solid foods

	<u>Months</u>						
	<1	1-3	4-6	7-9	10-12	>13- >24	none ^a
	% of total responses						
<u>Liquids/semi-solids:</u>							
Sugar water	0	38.1	0	0	0	0	61.9
Tea (herb tea with sugar)	23.8	42.8	14.3	4.8	0	0	14.3
Coffee (with sugar)	0	23.8	23.8	0	4.8	9.5	38.1
Soft drinks	0	4.8	14.4	4.8	4.8	4.8	66.4
Fruit juices (with sugar)	0	52.3	9.6	4.8	0	0	33.3
Gruel (cornstarch, manioc)	2.4	9.6	7.2	4.8	2.4	0	73.6
Soup (eg. rice/bean)	0	19.0	28.7	4.8	4.8	0	42.7
<u>Solids:</u>							
Bread	0	33.3	42.8	9.5	9.5	0	4.9
Fruit/vegetables	0	11.9	38.0	0	4.8	0	45.3
Rice	0	23.8	47.7	9.5	0	9.5	9.5
Beans	0	9.6	47.6	9.5	4.8	9.5	19.0
Eggs/meat/fish	0	19.0	26.2	9.5	7.2	2.4	35.7
Regular family food	0	4.8	28.4	19.2	23.8	9.6	14.2

^a Responses included those infants who were not given the stated food item and infants who might not yet be at the age where the particular food item would be introduced.

TABLE 4

Infant feeding practices during illness

Feeding practices	<u>Fever</u>		<u>Diarrhea</u>		<u>Other illnesses</u>	
	n	%	n	%	n	%
Feed infants the same as when they are well	9	42.9	7	33.3	13	61.9
Do not give infants anything to eat or drink	0	0	4	19.1	1	4.8
Give infants only drinks	5	23.8	2	9.5	2	9.5
Give infants purges	-	-	8	38.1	0	0
Other	7 ^a	33.3	0	0	5 ^b	23.8
Total	21	100.0	21	100.0	21	100.0

a Includes: soup, tea and cookies, gruel made from wheat flour.

b Not known.

and rice (cereal group) were highly preferred, which is explained by the cultural basis of rice and beans in Brazilian diets. Regarding dairy products, cheese, not milk, was the food item preferred by most respondents. Chicken and liver were preferred by all women. In the fruit group, only jaboticaba was unanimously preferred by all respondents. Beverages preferred by most women were coffee with sugar (Brazil's national beverage), guarana (a carbonated Brazilian drink), and chocolate. Although soybeans were disliked by a significant percentage of women, soybean oil was preferred by most women.

Women generally expressed preferences for a variety of food, although a significant number of respondents indicated a dislike of readily available products such as soybeans and egg plant.

3) Frequency of Food Intake by Woman

Female household heads (n=47) were asked to indicate frequency of consumption of specified food items. The most popular foods consumed are reported in Table 6. Although the majority of women had previously reported preference for a wide variety of foods, daily food intake in terms of variety was very limited. Foods generally consumed on a daily basis were rice, beans, and coffee with sugar. Chicken, liver, and cheese, although highly preferred, were infrequently consumed. Vegetable intake was generally low, with onions used once a day and chayote several times per week. Intake of fruit and empty energy foods such as carbonated beverages occurred on an infrequent basis. From the limited number and variety of food intakes reported, most women would be expected to be at high risk

TABLE 5

Foods most frequently preferred by female household heads^a

Food group	Like	Dislike	Never tried/ unfamiliar
Dairy products	cheese (96)	goat milk (23)	goat milk (53)
Meat/eggs	chicken (100)	shrimp (28)	cat (89) goat (62) mutton (62)
Organ meats	liver (100)	brain (28)	brain (11)
Legumes	beans (98) (excluding soybeans)	soybeans (38)	lentils (64)
Cereals	rice (100) bread rolls (100) wheat flour (100)	oatmeal (28)	whole wheat bread (51)
Vegetables	manioc ^b (100) corn (100) tomato (100) chayote (100) onion greens (100) wild chicory (100)	egg plant (55)	manioc ^b leaves (79)
Fruits	<u>jaboticaba</u> ^c (100)	<u>jatoba</u> ^d (58)	nectarine (89)
Beverages	coffee with sugar (94) <u>guarana</u> ^e (94) chocolate (94)	coffee without sugar (74)	<u>pinga</u> ^f (40)
Sweets/desserts	unrefined sugar (100)	honey (15)	refined sugar (2) cakes/ biscuits (2)
Nuts/seeds	coconut (79)	cashew nut (30) cotton seed (30)	jak fruit seed (57) cotton seed (57) cocoa butter (53)
Fats/oils	margarine (96) soybean oil (96)	beef fat (43)	
Condiments	tomato sauce (100) salt (100)	ginger (13) bay leaf (13) red pepper (13)	paprika (83)

^a Figures in parentheses express percent of respondents.

^b Cassava.

^c Round dark red-purple fruit the size of a cherry.

^d A tropical fruit.

^e Carbonated drink made from a small red Amazonian berry (guarana).

^f A crude rum made from sugar cane.

for inadequate nutrient intake such as ascorbic acid, iron, calcium, riboflavin, and vitamin A.

Most respondents (85.7%) reported that dietary patterns varied on certain days of the week or special occasions, especially Sundays and Christmas. Food or beverages most frequently consumed during these days or special occasions were macaroni, chicken, other meat, wine, beer, or carbonated drinks. The reason most often cited by respondents (41.1%) for eating these foods, particularly during these times, was that the family could not afford to buy these foods every day. Insufficient income is, therefore, probably a major factor in the difference observed between women's reported food preferences and frequency of food consumption.

4) 24-Hour Food Intake

a) Women

Results of estimated mean daily nutrient intakes of Vila Diogo women (n=37) and comparison with international standards are reported in Table 7. Nutrients showing the greatest variation in intake, as indicated by the standard deviation, were vitamin A, riboflavin, and ascorbic acid, implying that a few women may have consumed foods rich in these nutrients.

Food and Agriculture Organization (FAO) standards with cut-off points of two- and one-third of recommended levels were used to compare women's intakes. Brazilian standards were not available. Nutrients which women most frequently failed in meeting two-thirds of FAO recommended levels were calcium, iron, vitamin A, riboflavin, and ascorbic acid. If women, who did

TABLE 6

Frequency of food consumption by female household heads^a

Food group	Daily	2-3 times per week	Once in a while	Never
Dairy products	powdered milk (11)	skim milk (4)	cheese (70)	goat milk (96)
Meat/eggs	eggs (17)	beef (21)	chicken (85)	cat (100) goat (98)
Organ meats	0	liver (2)	liver (79)	brain (49)
Legumes	beans (91) (excluding soybeans)	beans (2)	dried peas (34)	lentils (91) soybeans (91)
Cereals	rice (100)	macaroni (28)	macaroni (55)	arrowroot (94)
Vegetables	onion (64)	chayote (23)	potato (87) manioc ^b (87)	manioc ^b leaves (96) beet leaves (96)
Fruits	<u>limao</u> ^c (28)	banana (9)	avocado (83) banana (83) Brazilian tangerine (83)	nectarine (98) grapefruit (89)
Beverages	coffee with sugar (91)	<u>guarana</u> ^d (6)	carbonated beverages (72)	<u>pinga</u> ^e (98)
Sweets/desserts	unrefined sugar (96)	ice cream (2) unrefined sugar (2) cakes/ biscuits (2)	ice cream (68)	refined sugar (79)
Nuts/seeds	0	0	peanuts (45)	jak fruit seeds (94) cashew nuts (94)
Fats/oils	butter (15) margarine (15)	butter (2) pork fat (2) olive oil (2)	soybean oil (85)	cocoa butter (94)
Condiments	salt (100)	tomato sauce (4) pepper sauce (4)	tomato sauce (72)	paprika (98)

^a Figures in parentheses express percent of respondents.

^b Cassava.

^c A fruit resembling a cross between a lemon and an orange.

^d Carbonated drink made from a small red Amazonian berry (guarana).

^e A crude rum made from sugar cane.

not meet one-third FAO levels for these nutrients, continued these low intakes, they would probably be at a high risk for nutrient deficiencies. Protein and α -tocopherol intakes were nutrients which women were most successful in achieving FAO recommended intakes.

The percentage contribution of food groups to women's nutrient intake, reported in Table 8, indicated that cereals and legumes (specifically rice and beans) were the main sources of energy, protein, and calcium. Dairy products, a rich source of calcium, provided only a small percentage of calcium intake. Iron intake was obtained primarily from less readily absorbable non-heme sources such as legumes. Vitamin A-rich foods (animal protein, dairy products, dark yellow and green vegetables) provided only a small proportion of total vitamin A intake; legumes accounted for the majority of vitamin A intake. Thiamin, riboflavin, and niacin intakes were provided mainly by legume and animal protein sources, with negligible amounts contributed by dairy sources. Majority of ascorbic acid intake originated from vegetables (other than dark green and yellow types) rather than fruit.

Percentage contribution of various food groups to nutrient intake provided additional evidence that some women could be at high risk for inadequate intake of specific nutrients. Good sources of calcium (dairy products), ascorbic acid (fruit, dark green and yellow vegetables), vitamin A (meat, dairy products, dark green and yellow vegetables), iron (animal protein, and riboflavin (dairy products) provided little of the total daily intake. With a daily diet consisting primarily of rice, beans, and sweetened coffee, it is highly probable that this diet, lacking in variety,

TABLE 7

Comparison of estimated mean daily nutrient intakes of women with international standards^a

Nutrient	Recommended daily intake	Mean intake \pm SD	Daily intake <2/3 FAO standard		Daily intake <1/3 FAO standard	
			n	%	n	%
Energy (Kcal) (MJ)	2200 9.2	1426 \pm 702.6 5.99	24	64.9	5	13.5
Protein (g)	41 ^b	41.7 \pm 30.4	12	32.4	2	5.4
Calcium (mg)	400	204.2 \pm 176.1	30	81.1	17	45.9
Iron (mg)	19 ^c	7.17 \pm 3.76	33	89.2	17	45.9
Vitamin A (RE)	750	673.2 \pm 2685.9	33	89.2	27	73.0
Thiamin (mg)	0.9	0.62 \pm 0.37	21	56.8	5	13.5
Riboflavin (mg)	1.3	0.60 \pm 0.90	33	89.2	16	43.2
Niacin (mg)	14.5	7.63 \pm 5.19	26	70.3	14	37.8
Ascorbic acid (mg)	30	13.5 \pm 23.7	32	86.5	25	67.6
α -Tocopherol (mg) ^d	6 ^e	5.53 \pm 2.81	10	27.0	2	5.4

^a Food and Agriculture Organization (FAO), Beaton and Patwardhan, 1976.

^b Based on mixed cereal-legume diet with small amounts of animal source foods.

^c If proportion of energy derived from animal sources or soybean is 10 - 25%.

^d Based on α -Tocopherol equivalents.

^e Based on Canadian Recommended Daily Nutrient Intakes, 1983.

cannot adequately provide sufficient intakes of most nutrients, with the exception of α -tocopherol and protein.

Distribution of women's energy intake from macro-nutrients (Table 9), however, was probably satisfactory. Almost one-half of the total daily energy intake originated from complex carbohydrates, with only a small proportion being derived from simple sugars (sugar and carbonated beverages). Alcoholic beverages did not contribute to energy intake. Furthermore, diets were high in polyunsaturated fatty acids (eg. linoleic acid) and relatively low in saturated fatty acids.

b) Children

Daily nutrient intake of Vila Diogo children (n=8) age 2 to 5 years was estimated by interviewing mothers using the 24-hour food recall method. Of all households who consented to participate, only 8 children were in the 2 to 5 year age group. Results of estimated mean daily intakes and comparison with FAO recommendations are reported in Table 10.

Children's estimated daily nutrient intakes appeared more satisfactory than that reported by women. Although one-half or more of children did not meet two-thirds FAO recommended levels for vitamin A, niacin, ascorbic acid, calcium, iron, and α -tocopherol, ascorbic acid intake was the only nutrient that one-half of children were unsuccessful in meeting one-third FAO recommended intakes. Some children could, therefore, be at a high risk for ascorbic acid deficiency.

Percentage contribution of food groups to children's nutrient intake (Table 11) indicated that energy intake was provided primarily by cereal

TABLE 8

Percentage contribution of food groups to nutrient intake of women

Nutrient		Food Groups									
		Dairy products	Animal protein sources	Legumes	Dark Green	Dark Yellow	Other	Fruit	Cereals		
Energy	Mean \pm SD	1.3 \pm 3.1	12.2 \pm 13.7	26.3 \pm 12.4	0.04 \pm 0.1	0.2 \pm 0.5	1.5 \pm 2.7	0.5 \pm 1.9	48.4 \pm 12.0	4.7 \pm 4.6	
	Range	0 - 11.6	0 - 44.3	0 - 47.0	0 - 0.7	0 - 1.9	0 - 14.5	0 - 8.6	22.2 - 69.1	0 - 14.6	
Protein	Mean \pm SD	2.7 \pm 5.8	31.0 \pm 29.8	33.3 \pm 19.6	0.2 \pm 0.7	0.4 \pm 1.0	1.4 \pm 2.3	0.4 \pm 1.8	30.6 \pm 13.5	0	
	Range	0 - 20.2	0 - 91.7	0 - 62.9	0 - 3.5	0 - 3.5	0 - 6.3	0 - 9.7	8.3 - 55.7	0	
Calcium	Mean \pm SD	12.7 \pm 26.5	13.0 \pm 19.1	28.1 \pm 16.4	1.3 \pm 4.7	1.2 \pm 3.1	5.8 \pm 10.7	2.2 \pm 9.0	31.7 \pm 13.8	0	
	Range	0 - 89.1	0 - 68.4	0 - 55.8	0 - 23.3	0 - 12.8	0 - 53.6	0 - 39.6	4.7 - 57.4	0	
Iron	Mean \pm SD	1.1 \pm 2.7	19.1 \pm 21.2	54.2 \pm 21.9	0.6 \pm 2.2	0.7 \pm 1.6	3.8 \pm 5.5	1.2 \pm 4.7	17.0 \pm 7.2	0	
	Range	0 - 12.6	0 - 80.8	0 - 84.1	0 - 9.9	0 - 5.6	0 - 26.5	0 - 22.8	5.8 - 43.6	0	
Vitamin A	Mean \pm SD	5.4 \pm 13.5	17.4 \pm 28.0	30.7 \pm 30.7	5.0 \pm 18.9	14.4 \pm 33.2	13.7 \pm 23.0	1.6 \pm 6.8	1.5 \pm 6.1	10.6 \pm 12.6	
	Range	0 - 48.9	0 - 99.2	0 - 100.0	0 - 92.6	0 - 94.7	0 - 73.1	0 - 36.4	0 - 33.2	0 - 46.8	
Thiamin	Mean \pm SD	1.5 \pm 3.8	22.8 \pm 24.9	48.8 \pm 23.1	0.3 \pm 0.9	0.7 \pm 1.6	3.1 \pm 4.2	1.8 \pm 7.3	19.4 \pm 9.6	0	
	Range	0 - 14.7	0 - 77.7	0 - 79.9	0 - 4.8	0 - 5.7	0 - 15.7	0 - 34.7	4.6 - 47.1	0	
Riboflavin	Mean \pm SD	6.2 \pm 13.8	34.8 \pm 32.0	32.1 \pm 22.4	0.8 \pm 3.1	1.5 \pm 3.8	5.7 \pm 9.9	1.3 \pm 5.3	14.2 \pm 7.2	0	
	Range	0 - 52.4	0 - 95.0	0 - 74.0	0 - 17.9	0 - 15.2	0 - 44.5	0 - 24.9	1.9 - 28.3	0	
Niacin	Mean \pm SD	0.3 \pm 0.6	29.6 \pm 30.8	19.3 \pm 11.8	0.2 \pm 0.7	0.7 \pm 1.7	3.5 \pm 5.8	0.5 \pm 2.3	33.0 \pm 16.2	0	
	Range	0 - 20.0	0 - 90.8	0 - 40.5	0 - 3.9	0 - 6.0	0 - 26.2	0 - 11.2	5.6 - 67.9	0	
Ascorbic Acid	Mean \pm SD	12.0 \pm 30.8	2.8 \pm 15.8	0	4.1 \pm 17.9	13.2 \pm 30.2	59.0 \pm 46.2	9.0 \pm 28.4	0	0	
	Range	0 - 100.0	0 - 89.1	0	0 - 100.0	0 - 100.0	0 - 100.0	0 - 100.0	0	0	
α -Tocopherol	Mean \pm SD	0.5 \pm 1.4	6.9 \pm 11.3	38.8 \pm 16.4	0.9 \pm 3.7	0.8 \pm 2.0	2.4 \pm 4.7	0.1 \pm 0.5	35.6 \pm 11.8	13.3 \pm 14.2	
	Range	0 - 5.9	0 - 33.0	0 - 60.8	0 - 20.5	0 - 7.0	0 - 25.5	0 - 2.4	1.7 - 63.2	0 - 61.5	

Note: Percentages of various food groups do not equal 100% because of rounding off of percentages and omission of miscellaneous items (eg. sugar, coffee).

TABLE 9

Distribution of energy intake from macro-nutrients

Source	24 - Hour energy distribution			
	Women		Children	
	Kcal (MJ)	% of total energy	Kcal (MJ)	% of total energy
Protein (total)	166.8 (0.70)	11.8	120.4 (0.51)	12.3
Carbohydrate (total)	700.8 (2.94)	49.1	464.4 (1.95)	47.4
Sugar	66.0 (0.28)	4.6	54.3 (0.23)	5.6
Carbonated drinks	6.1 (0.03)	0.4	30.6 (0.13)	3.2
Fat (total)	557.1 (2.34)	39.1	394.2 (1.67)	40.3
Saturated fatty acids	122.4 (0.51)	8.6	115.2 (0.48)	11.9
Oleic acid	160.2 (0.67)	11.2	123.3 (0.52)	12.7
Linoleic acid	232.2 (0.98)	16.3	124.2 (0.52)	12.8

Note: No alcohol consumption was reported during the survey period.

TABLE 10

Comparison of estimated mean daily nutrient intakes of children
with international standards^a

Nutrient	Recommended daily intake	Mean intake \pm SD	Daily intake <2/3 FAO standard		Daily intake <1/3 FAO standard	
			n	%	n	%
Energy (Kcal) (MJ)	1360 5.7	971.7 \pm 358.2 4.08	3	37.5	0	0
Protein (g)	23 ^b	30.1 \pm 13.7	1	12.5	0	0
Calcium (mg)	400	359.3 \pm 305.9	4	50.0	1	12.5
Iron (mg)	7 ^c	4.86 \pm 2.23	4	75.0	1	12.5
Vitamin A (RE)	250	1184.9 \pm 2209.6	6	75.0	2	25.0
Thiamin (mg)	0.5	0.53 \pm 0.41	1	12.5	1	12.5
Riboflavin (mg)	0.8	0.87 \pm 1.10	3	37.5	1	12.5
Niacin (mg)	9.0	5.02 \pm 3.06	6	75.0	1	12.5
Ascorbic acid (mg)	20	8.1 \pm 5.9	7	87.5	4	50.0
α -Tocopherol (mg) ^d	4 ^e	2.98 \pm 1.33	4	50.0	0	0

- a Food and Agriculture Organization (FAO), Beaton and Patwardhan, 1976.
- b Based on mixed cereal-legume diet with small amounts of animal source foods.
- c If proportion of energy derived from animal sources or soybean is 10 - 25%.
- d Based on α -Tocopherol equivalents.
- e Based on Canadian Recommended Daily Nutrient Intakes, 1983.

sources (i.e. rice). Due to significant milk consumption, protein sources were almost equally derived from dairy products, animal protein, and cereals. Furthermore, dairy products were the main contributor of calcium and vitamin A intake. Some iron intake was obtained from more readily absorbable heme sources (animal protein), with most iron intake, however, originating from less readily absorbable sources such as legumes and cereals. As was observed in women's nutrient intakes, no ascorbic acid was obtained from rich ascorbic acid sources such as fruit or dark green and yellow vegetables. Dairy products and animal protein, good sources of riboflavin, niacin, and thiamin, however, were the primary contributors to children's intakes of these nutrients. Distribution of children's energy intake from macro-nutrients was satisfactory and was similar to that reported for women (Table 9).

Compared to women, children's nutrient intakes appeared more satisfactory, an observation probably explained by the high prevalence of milk consumption. Children's intake of ascorbic acid, however, was similar to that reported for women, and children could be at high risk, therefore, for ascorbic acid deficiency.

b) Anthropometric Assessment

1) Anthropometric Status of Women

The mean and range of several anthropometric measurements (weight, height, mid-upper-arm circumference (MUAC), triceps skinfold (TSF) thickness, mid-upper-arm muscle circumference (MUAMC)) of women (Table 12)

TABLE 11

Percentage contribution of food groups to nutrient intake of children

Nutrient		Food Groups ^a							
		Dairy products	Animal protein sources	Legumes	Vegetables		Cereals	Fats/oils	
					Dark Green	Other			
Energy	Mean \pm SD	12.3 \pm 13.8	16.1 \pm 18.0	15.2 \pm 5.5	0	1.5 \pm 1.6	43.0 \pm 17.2	5.4 \pm 5.1	
	Range	1.7 - 39.9	0 - 57.4	3.1 - 19.6	0	0 - 3.9	20.5 - 71.2	0 - 13.8	
Protein	Mean \pm SD	22.8 \pm 19.2	28.1 \pm 26.1	16.9 \pm 8.5	0.2 \pm 0.5	1.6 \pm 1.7	30.4 \pm 17.3	0	
	Range	3.2 - 52.5	0 - 71.2	1.8 - 30.8	0 - 1.2	0 - 4.2	7.7 - 60.3	0	
Calcium	Mean \pm SD	66.0 \pm 23.1	3.9 \pm 6.0	8.5 \pm 5.8	2.1 \pm 4.3	2.5 \pm 3.7	14.8 \pm 11.3	0	
	Range	34.9 - 94.5	0 - 16.3	0.3 - 17.0	0 - 12.0	0 - 10.2	1.6 - 35.5	0	
Iron	Mean \pm SD	10.8 \pm 9.6	23.5 \pm 23.6	36.3 \pm 15.9	0.9 \pm 2.1	4.3 \pm 4.6	21.6 \pm 8.7	0	
	Range	1.6 - 27.7	0 - 68.5	3.8 - 58.2	0 - 5.9	0 - 13.3	5.0 - 33.3	0	
Vitamin A	Mean \pm SD	30.5 \pm 26.6	18.5 \pm 35.7	16.3 \pm 18.5	12.7 \pm 31.1	13.4 \pm 15.7	0.4 \pm 1.0	8.1 \pm 7.7	
	Range	2.2 - 78.0	0 - 97.8	0 - 58.9	0 - 89.0	0 - 45.3	0 - 2.8	0 - 16.7	
Thiamin	Mean \pm SD	16.6 \pm 17.0	32.5 \pm 22.8	27.6 \pm 5.4	0.5 \pm 1.0	4.1 \pm 4.0	18.3 \pm 11.0	0	
	Range	1.1 - 48.5	0 - 74.3	4.4 - 52.9	0 - 2.8	0 - 9.9	7.3 - 41.0	0	
Riboflavin	Mean \pm SD	45.3 \pm 25.1	30.2 \pm 28.7	10.1 \pm 6.9	0.6 \pm 1.2	2.7 \pm 3.2	9.2 \pm 7.1	0	
	Range	11.9 - 86.7	0 - 69.8	0.3 - 24.4	0 - 2.8	0 - 9.0	0.6 - 24.4	0	
Niacin	Mean \pm SD	4.1 \pm 4.2	39.2 \pm 33.5	17.9 \pm 16.6	0.2 \pm 0.4	15.7 \pm 29.8	34.9 \pm 22.4	0	
	Range	0.3 - 13.2	0 - 85.8	0.9 - 20.1	0 - 1.1	0 - 15.6	7.1 - 75.7	0	
Ascorbic Acid	Mean \pm SD	29.6 \pm 32.4	8.6 \pm 24.4	0	13.4 \pm 32.6	45.9 \pm 40.0	0	0	
	Range	2.8 - 100.0	0 - 68.9	0	0 - 93.3	0 - 89.4	0	0	
α -Tocopherol	Mean \pm SD	4.3 \pm 5.3	10.1 \pm 18.6	30.2 \pm 12.5	2.9 \pm 7.9	1.9 \pm 2.3	32.4 \pm 17.1	18.0 \pm 16.7	
	Range	0.7 - 14.4	0 - 54.5	6.6 - 45.3	0 - 22.5	0 - 6.3	20.3 - 65.2	0 - 43.9	

^a No intake was reported for fruit nor dark yellow vegetables.

Note: Percentages of various food groups do not equal 100% because of rounding off of percentages and omission of miscellaneous items (eg. sugar, coffee).

indicated a wide range of values for weight and TSF thickness. Because local Brazilian standards were not available, anthropometric measurements were compared to National Centre for Health Statistics (NCHS) standards and Frisancho's standards (Table 13). NCHS standards were derived from USA (HANES) data. The only standards available for MUAC, TSF, and MUAMC were prepared by Frisancho (1974) from Ten State Nutrition Survey (TSNS) data.

Results indicated that more than one-half of women (62.4%) had weight for height values below the 50th percentile or median, implying that some women were probably underweight. A more significant observation was that 28.0% of women had weight for height values at or below the 5th percentile, indicating a significant proportion of women were undernourished. Comparison of MUAC, TSF thickness, and MUAMC with Frisancho's standards confirmed that some women were exhibiting varying degrees of malnutrition. A large percentage of women (20.0%), for example, had TSF thickness at or below the 5th percentile, indicating that little or no energy reserves were present as fat.

TABLE 12

Anthropometric measurements of women

	n	Mean \pm SD	Range
Weight (kg)	40	58.5 \pm 14.5	36.7 - 93.5
Height (cm)	40	150.2 \pm 6.9	137.5 - 164.5
MUAC ^a (cm)	67	27.2 \pm 4.1	18.6 - 37.4
TSF ^b (mm)	67	15.5 \pm 6.2	4.0 - 29.0
MUAMC ^c (cm)	67	22.3 \pm 2.8	17.3 - 28.7

a Mid-upper arm circumference.

b Triceps skinfold thickness.

c Mid-upper arm muscle circumference.

TABLE 13

Comparison of women's anthropometric measurements
with international standards^a

		<u>NCHS^b Percentiles</u>						Total
		<5	5	10	25	50	75	
Weight for height		8	1	6	5	6	4	32
% of total responses		25.0	3.0	18.8	15.6	18.8	12.5	100
		<u>Frisancho Percentiles^c</u>						Total
		<5	5	15	50	85	>95	
MUAC ^d		3	2	10	14	8	3	40
% of total responses		7.5	5.0	25.0	35.0	20.0	7.5	100
TSF thickness ^e		4	4	12	18	2	0	40
% of total responses		10.0	10.0	30.0	45.0	5.0	0	100
MUAMC ^f		0	0	6	16	13	5	40
% of total responses		0	0	15.0	40.0	32.5	12.5	100

a Figures express number of responses.

b National Centre for Health Statistics.

c Frisancho (1974) - standards derived from Ten State Nutrition Survey (TSNS) data, 1968 - 1970.

d Mid-upper arm circumference.

e Triceps skinfold thickness.

f Mid-upper arm muscle circumference.

2) Anthropometric Status of Children

a) Weight for Age

Weight for age was plotted graphically for children under the age of 5 years, using NCHS Growth Charts (Figure 5). Weights of children were compared to the 5th, 50th, and 95th NCHS percentiles and the Marcondes' 50th percentile. Marcondes' standards were derived from data obtained primarily from Brazilian low socioeconomic groups. As expected, lower anthropometric values, as noted by comparison of Marcondes' 50th percentile with NCHS values, were observed.

For the majority of boys (76.9%), weights for age were below NCHS's median (50th percentile), implying that a significant number of boys were underweight for their age. In contrast, fewer girls (65.0%) had weights less than the NCHS median.

Although weight for age results indicated some children were underweight, weight for age index does not consider children who, because of a small frame size, may have normal weights. The percentage of children who may be actually classified as underweight will be less than indicated by the weight for age index.

b) Height for Age

When height or length for age of children was compared to NCHS and Marcondes' standards (Figure 6), almost one-half of boys (46.2%) and one-third of girls (31.6%) had height for age values less than the NCHS 5th percentile. Because height for age is an indicator of past nutritional

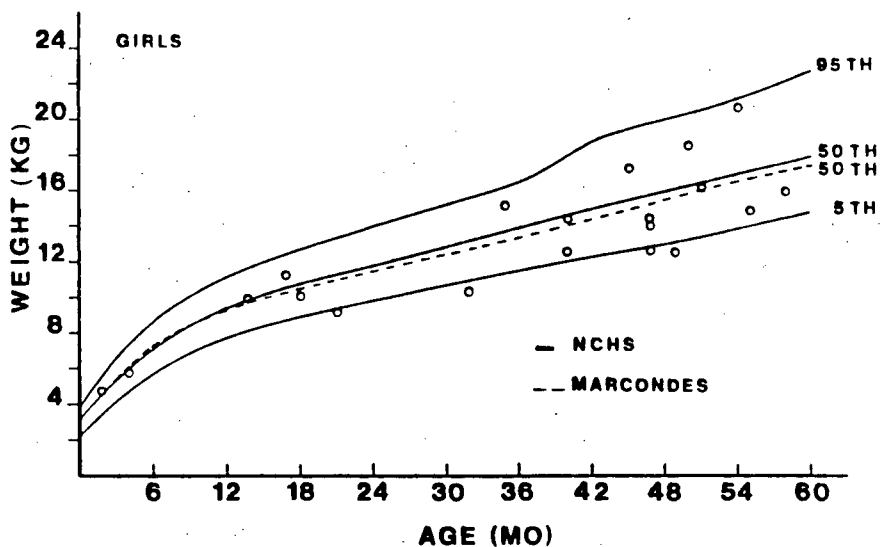
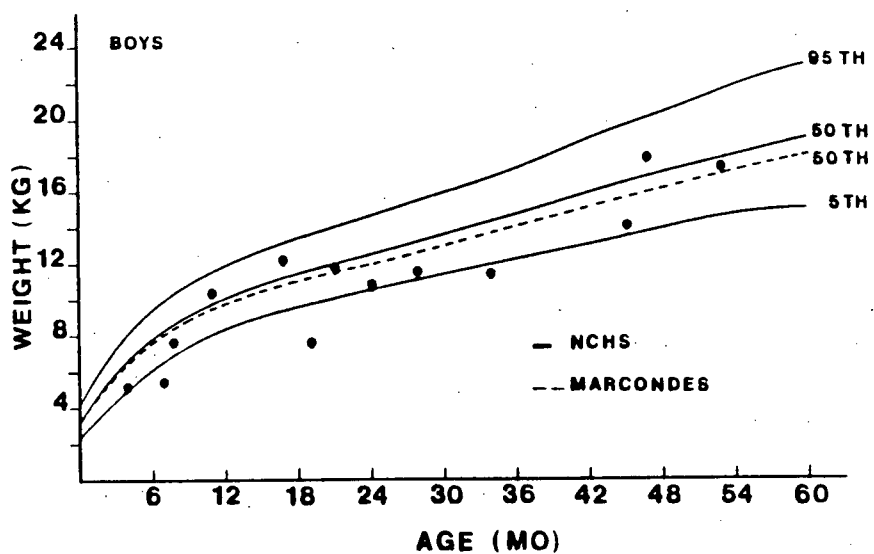


Figure 5. Comparison of boys' and girls' weights for age with National Centre for Health Statistics (NCHS) and Marcondes' percentiles.

state, these results indicated that stunting appeared to exist in a significant percentage of children. Poor nutrition, therefore, was a likely factor involved directly or indirectly in stunted growth.

c) Weight for Height

Since weight for height or length index considers weight of subjects in terms of body frame size, subjects with a small frame but normal weight will not be classified as underweight or malnourished. Weight for height index, therefore, is a more accurate index than weight for age in describing current nutritional state of children.

A comparison of weight for height for children in this study with NCHS and Marcondes' percentiles (Figure 7) confirmed that fewer boys and girls had weight for height values below the NCHS 5th percentile compared to weight for age. Furthermore, the number of values below the NCHS median was about 50% less when weight for height index was used compared to weight for age. Although many children were stunted in growth, the majority of children appeared to have satisfactory weights for body size.

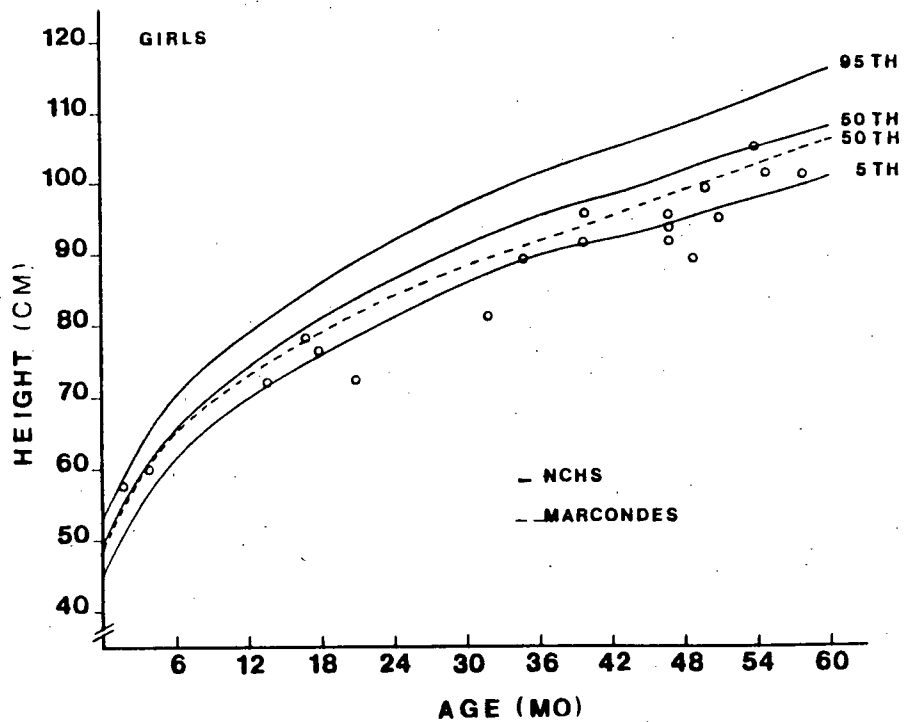
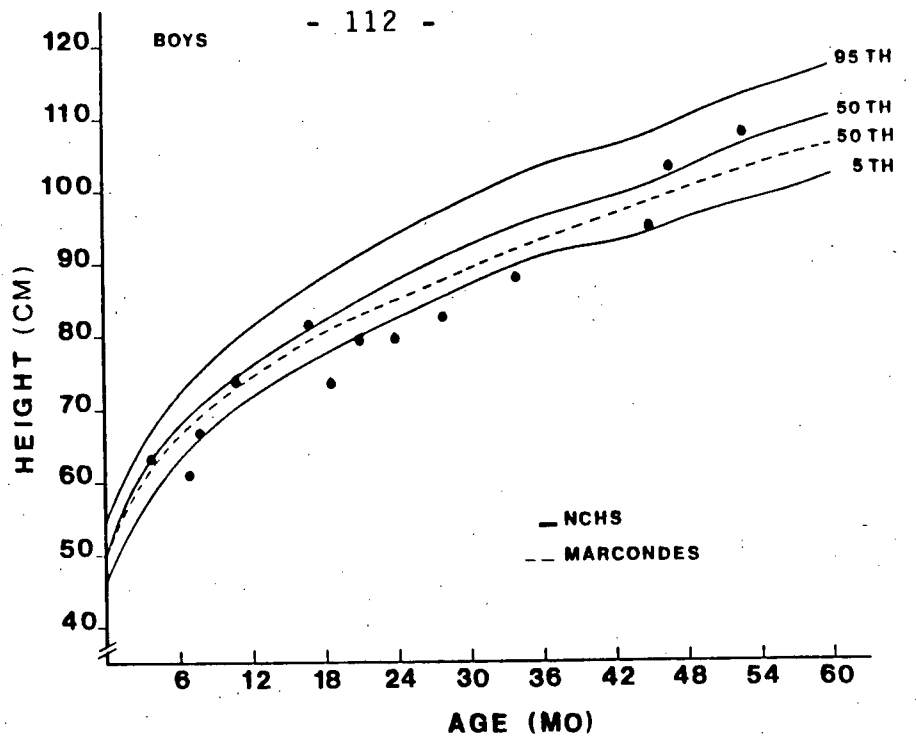


Figure 6. Comparison of boys' and girls' height for age with National Centre for Health Statistics (NCHS) and Marcondes' percentiles.

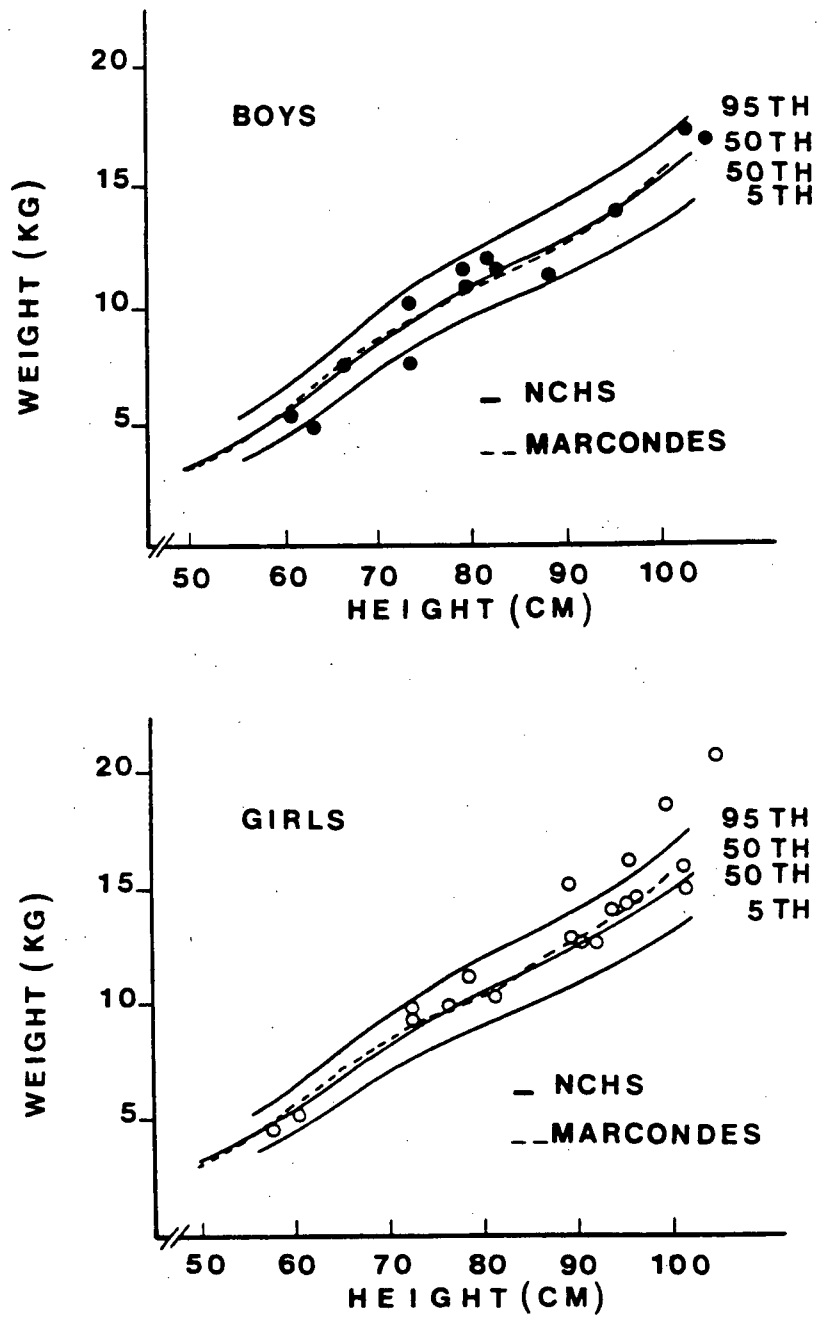


Figure 7. Comparison of boys' and girls' weight for height with National Centre for Health Statistics (NCHS) and Marcondes' percentiles.

d) Head Circumference

Head growth occurs most rapidly during the first few years of life. Use of head circumference measurements in children, therefore, is a sensitive indicator to measure the presence of current malnutrition.

Head circumference of children less than 3 years of age was compared with NCHS and Marcondes' standards (Figure 8). Differences were observed between Marcondes' and NCHS's 50th percentiles. Although difficulties in conducting measurements could perhaps partially explain some of the extreme values obtained, more boys than girls (61.5% vs. 45.5%) had values below the NCHS 50th percentile. Some young children were, therefore, probably not growing adequately due to poor nutrition.

e) Mid-Upper-Arm Circumference (MUAC), Triceps Skinfold (TSF) Thickness, and Mid-Upper-Arm Muscle Circumference (MUAMC)

The MUAC (Figure 9), TSF thickness (Figure 10), and MUAMC (Figure 11) of children under 5 years of age were compared to Frisancho's percentiles. No Brazilian standards were available for comparison.

MUAC has been used as an indicator in identifying subjects who are malnourished. Results in this study indicated boys and girls generally had MUAC values near or above Frisancho's median values (50th percentile), although some children had values approaching the 5th percentile. A few boys (10.5%) were probably malnourished as their MUAC values were below the 5th percentile.

Use of TSF thickness measurements, an indication of reserve energy stores as fat, demonstrated that children's TSF thickness values were

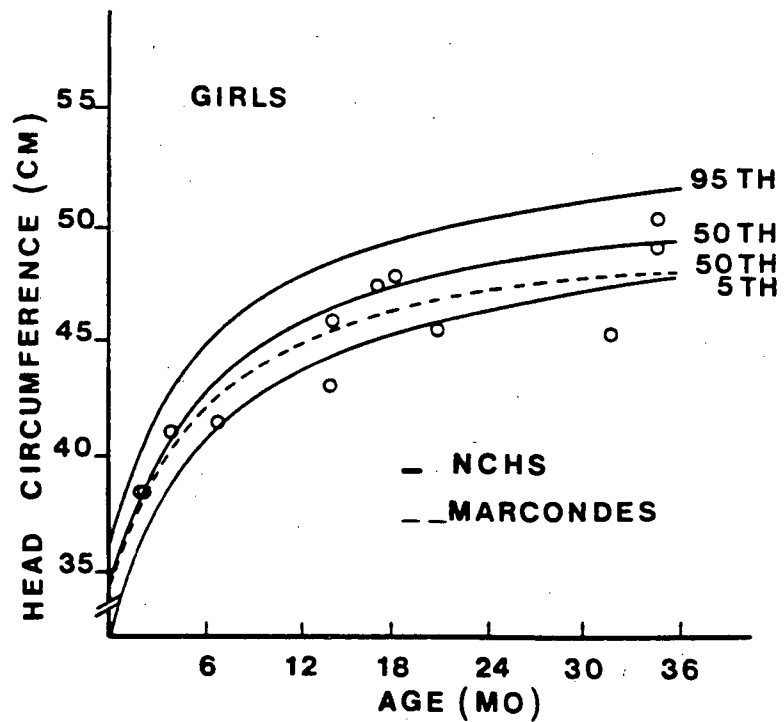
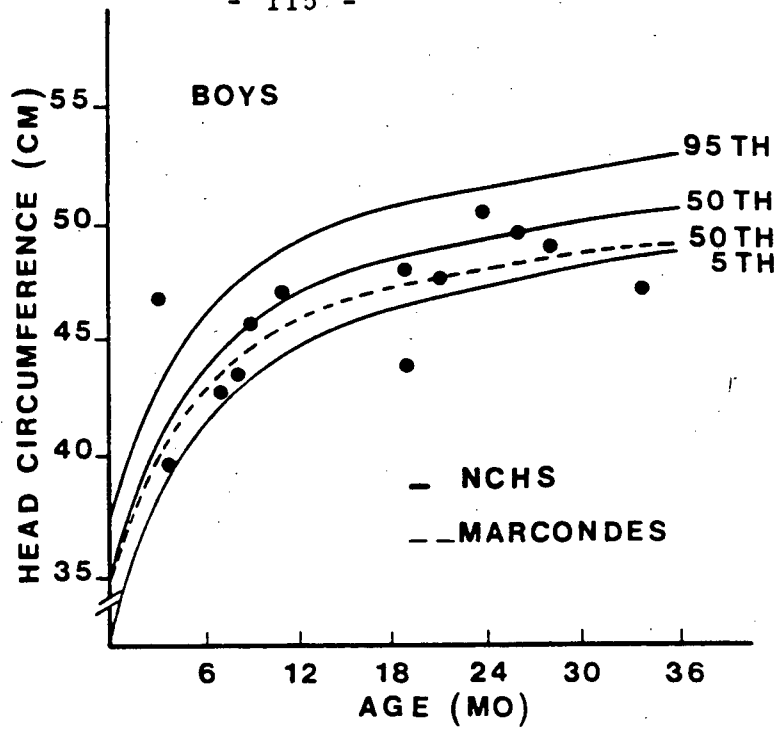


Figure 8. Comparison of boys' and girls' head circumference for age with National Centre for Health Statistics (NCHS) and Marcondes' percentiles.

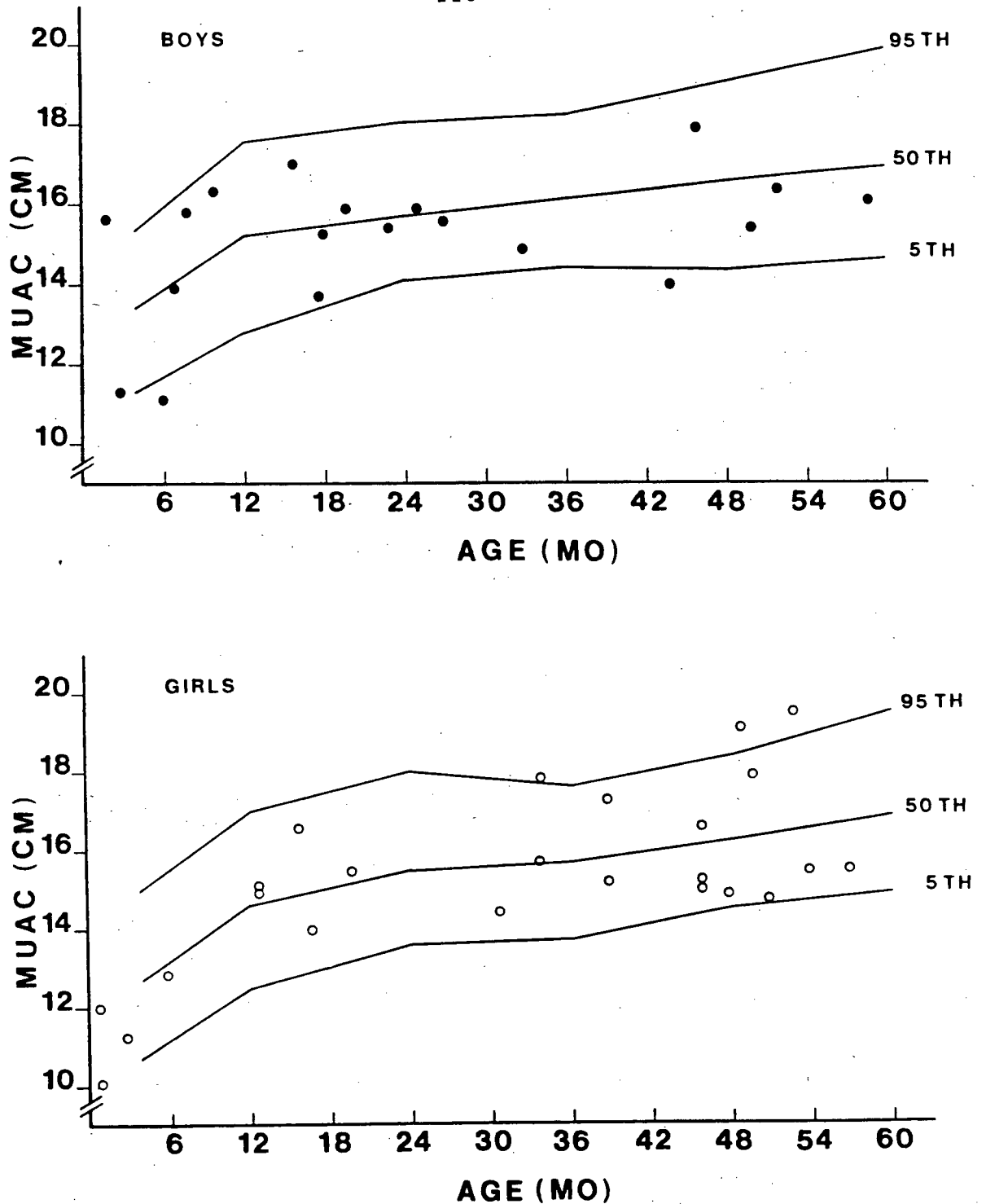


Figure 9. Comparison of boys' and girls' mid-upper-arm circumference (MUAC) with Ten State Nutrition Survey (TSNS) percentiles.

generally satisfactory, with the majority of values near or above the median. Calculation of children's MUAMC values from TSF thickness and MUAC was conducted to determine adequacy of muscle development; an indication of the amount of protein reserves. When MUAMC values were compared to Frisanch's standards, most values for boys and girls were satisfactory, although a few subjects had values near or below the 5th percentile, implying muscle development was poor.

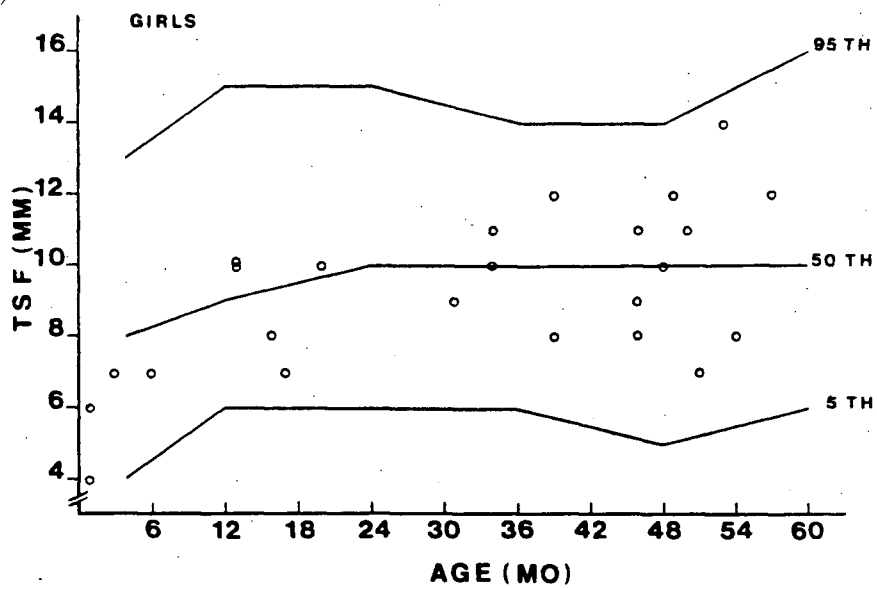
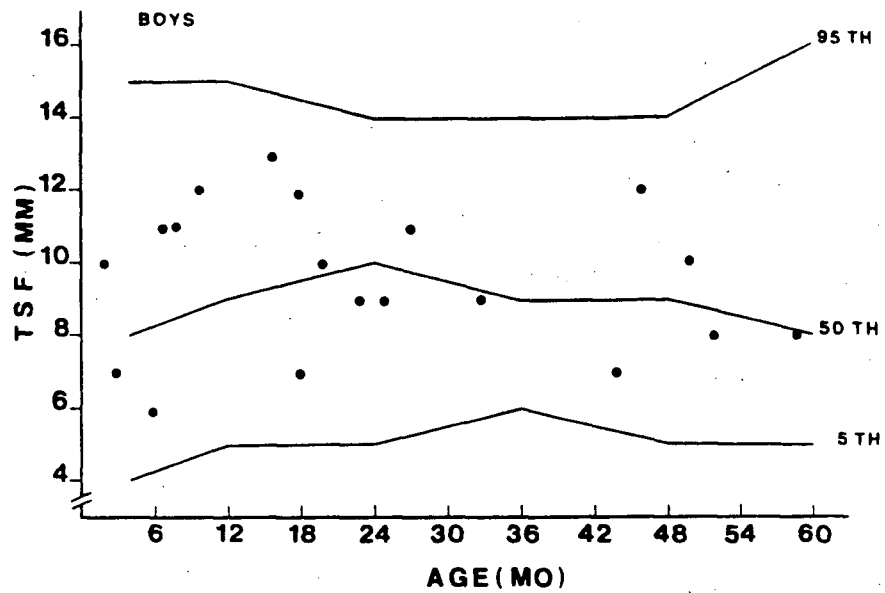


Figure 10. Comparison of boys' and girls triceps skinfold (TSF) thickness with Ten State Nutrition Survey (TSNS) percentiles.

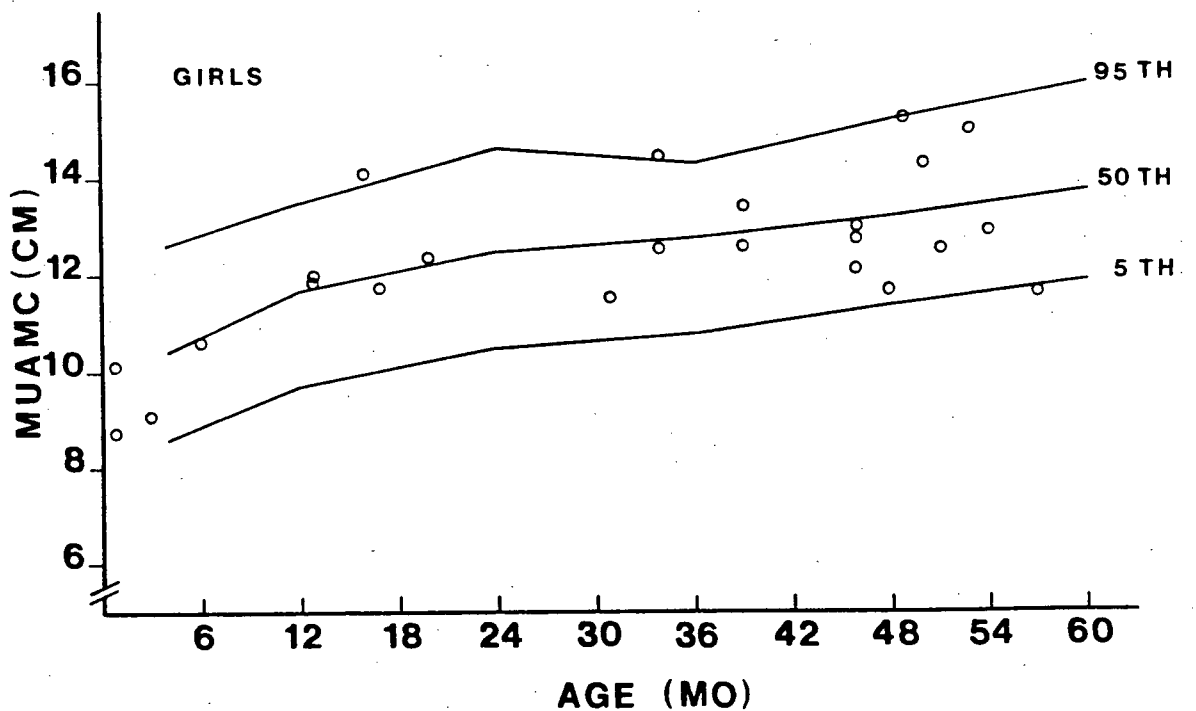
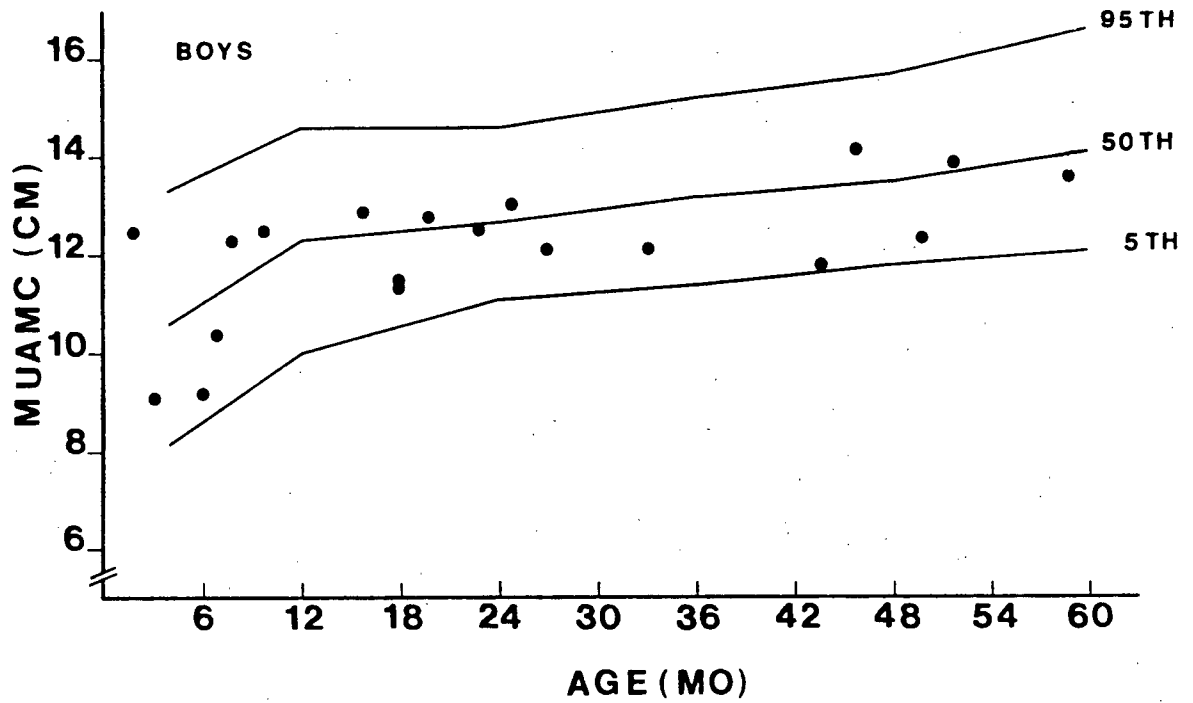


Figure 11. Comparison of boys' and girls mid-upper-arm muscle circumference (MUAMC) with Ten State Nutrition Survey (TSNS) percentiles.

c) Nutrition Knowledge and Attitudes/Beliefs

1) Nutrition Knowledge

Women (n=56) were questioned to determine the degree of nutrition knowledge regarding reasons for eating a variety of foods, quantity of food to be consumed during pregnancy or lactation, and the types of foods beneficial and detrimental to newborns and young children (Appendix G). Results (Table 14) indicated that the mean nutrition knowledge score was low ($25.3\% \pm 9.9$), with a range of scores from 4% to 60%. Majority of nutrition knowledge scores were below 50%, implying a low level of nutrition knowledge.

2) Nutrition Attitudes/Beliefs

Women (n=56) were questioned to determine their attitudes and beliefs regarding the origin of illness and consumption of special foods or food taboos during menstruation, pregnancy, lactation, and immediately post partum. Results indicated that a large percentage of respondents (37.3%) had no opinion regarding the origin of illness. A small number of respondents (16.8%), however, reported health and nutrition were implicated in illness, with contributing factors such as lack of food and consumption of contaminated water. Some women (13.6%) still believed in the hot/cold classification of disease; changes in weather, for example, were believed to cause illness.

Many respondents (69.6%) indicated that certain foods such as cold food and beverages (i.e. cold in temperature); vegetables such as cabbage,

TABLE 14

Distribution of nutrition knowledge scores by women ^a

Score	(%)	n	%
<25		23	41.1
25 - 49		27	48.2
50 - 74		6	10.7
75 - 100		0	0
Mean \pm SD	25.3 \pm 9.9		
Range	8 - 40		

^a Figures express number and percent of respondents.

onion, and red pepper; citrus fruits; acidic foods; and fish should not be consumed during menstruation. Reasons most frequently cited for food taboos were that the foods caused headaches, upset stomach or resulted in cessation of menstrual flow. Fewer respondents (19.6%) reported food taboos during pregnancy; red pepper and alcoholic beverages were mentioned most frequently. Red pepper was believed to cause colic and red discolouration in infants; alcohol was believed to result in birth defects and discolouration in newborns. Majority of women (73.2%) also believed that certain foods such as vegetables (onion, cabbage, red pepper, cucumber) and meat (fish, pork, other meat) should not be eaten immediately post partum. Vegetables were believed to cause illness and fever; meat was thought to cause colic, retention of water, and fissures of breast nipples. Furthermore, more than one-third of respondents (37.5%) reported food taboos such as red pepper, meat, and fruit (oranges, pineapple) during lactation. Red pepper was thought to pass into breast milk and cause discolouration in the infant; meat was believed to cause allergies in the baby and reduce lactation; acidic fruits were thought to cause colic and make breast milk acidic.

Respondents were also asked whether any special foods were thought to be important during menstruation, pregnancy, post partum, and lactation. Only a small percentage of women (16.1%) believed certain foods such as rice, beans, and meat should be eaten especially during menstruation. More women thought that consumption of meat and fruit should be emphasized during pregnancy. Meat was believed to make the woman and baby strong; fruit was considered important for baby's nourishment and strength. More

than one-half of respondents (62.5%) also believed special foods such as soup and milk were important for the woman immediately post partum. Because women were considered weak immediately post partum, soup was thought to be nourishing; milk was reported to increase quantity of breast milk. Women (66.1%) also reported that special foods such as soup, milk, and meat were especially necessary during lactation, for nourishment and to increase the quantity of breast milk.

Overall, many food taboos during various physiological states were reported by women. Although no nutritionally detrimental food beliefs were reported during pregnancy, other taboos such as restriction of certain foods immediately post partum and during lactation could have potentially negative nutritional consequences for the mother and indirectly for the infant. Not all food beliefs, however, had negative nutritional consequences. Food taboos, such as alcohol consumption during pregnancy, for instance, as well as beliefs in the consumption of milk immediately post partum and intake of meat and milk during lactation have positive nutritional implications for the mother and baby.

In summary, evidence obtained from various sources such as the demographic/socioeconomic questionnaire, dietary intakes, anthropometry, nutrition knowledge scores, and nutrition attitudes and beliefs suggested that optimum health and nutrition probably did not exist for most Vila Diogo women and children. The existing poor economic situation, unhygienic physical environment, retarded growth in children, nutritionally detrimental infant feeding practices, and inadequate nutrient intakes would have negative nutritional consequences for this population, especially for

nutritionally vulnerable groups such as children, pregnant and lactating women. Implementation of a nutrition education program for women (target group), emphasizing maximum use of available resources and importance of good nutrition practices on health and growth, appeared to be an appropriate nutrition intervention strategy for this population in these socioeconomic circumstances.

2. Nutrition Education Program Evaluation

a) Formative Evaluation

Written formative evaluations of nutrition education sessions were conducted after each session by instructors and primary investigator. Topics of evaluation included physical facilities, nutrition education material and presentation, instructors, and participants (Appendices J, K). The problems identified and appropriate action taken are described below.

1) Problem

Initial sessions began one-half hour later than advertised due to late arrival of participants.

Action Taken

Subsequent sessions were held one-half hour later than previously advertised.

2) Problem

Duration of initial session was one hour. Participants were observed to be increasingly restless near the end of the session.

Action Taken

Subsequent sessions were reduced to 30 to 45 minutes.

3) Problem

Insufficient audio visual materials for the number of participants attending the first session.

Action Taken

Additional audio visual materials were prepared and used as required.

4) Problem

Attendance decreased significantly after the initial session.

Action Taken

A lottery was held at the conclusion of each session, with a small gift awarded as a prize for children.

5) Problem

Poor attendance at one of the locations.

Action Taken

Although the location was in a favourable position in the favela, poor attendance forced cancellation of further sessions.

6) Problem

Disruption of nutrition education sessions by latecomers.

Action Taken

Sessions were subsequently delayed a few minutes until participants who regularly attended, arrived.

7) Problem

Instructor indicated feelings of insecurity in understanding nutrition education material.

Action Taken

Although a review of each lesson for both instructors was conducted by the research supervisor, additional discussion sessions were held between the primary investigator and instructors to answer further questions and clarify any misunderstandings.

8) Problem

Reading of nutrition education material by instructor to participants, with subsequent translation into a simpler vocabulary.

Action Taken

Nutrition education material was rewritten by the primary investigator using a simple format and vocabulary that participants would understand.

9) Problem

Lack of audience participation.

Action Taken

Questions were prepared by the primary investigator to increase audience participation.

10) Problem

Difficulty by participants in remembering nutrition education material presented in previous sessions.

Action Taken

Nutrition education material was reviewed in succeeding sessions, with questions directed to participants to obtain feed-back on participants' understanding and retention of previously presented material.

b) Summative Evaluation

Summative evaluation of the nutrition education program included written evaluations by the primary investigator and instructors (Appendix L) and statistical analysis of nutrition knowledge scores before and

after completion of the program. Written evaluation discussed topics such as choice of location, weather, length of the program, participants, instructors, and educational material.

A 10 week nutrition education program, following an interview period of two months, was considered too long for this population. Participants and instructors were observed to be less enthusiastic and interested near the conclusion of the program.

Weather was an important consideration because sessions were generally held outdoors. Fall and early winter seemed most appropriate as weather was hot, with little precipitation. Nice weather, however, was a disadvantage for women field labourers who generally were unable to attend.

Other important considerations were size of location, location in the favela, personality of the hostess, as well as interpersonal relationships among women. Some of the locations selected were somewhat small for the number of participants present. One of the hostesses was shy and sometimes ill. Furthermore, after cancellation of one of the locations due to poor attendance, remaining sessions were held in one area of the favela.

Participation by women in the nutrition education program was fair (46.4%). Regular attendance was poor, with 53.9% of program participants attending less than one-half of the weekly sessions. Average attendance was 8.5 ± 3.0 (range 2 to 15). A significant proportion of participants (26.9%), however, attended all sessions at least once a week. Furthermore, some participants (42.3%) had attended at least one session more than once a week.

Women who participated in the nutrition education program, generally, were older (mean 43.0 years \pm 15.6; range 19-77 years) than non participants (mean 37.7 years \pm 13.9; range 16-68 years). More than one-third of participants were past the age of childbearing or lived alone. Children attended sessions regularly and were enthusiastic participants.

A few women who attended sessions were talkative and participated readily; others were timid, although some women gradually became more involved in later sessions. Participants had difficulty in remembering past sessions and required continual review and repetition of material.

Vila Diogo women could be classified into several categories regarding participation or non participation in the nutrition education program:

- 1) A few women (2-3) were mentally incompetent and would probably not have benefitted from the nutrition education sessions, although they might have received benefits from the social aspects. These women, unfortunately, were ones who needed help regarding nutrition and who relied either on their husbands and/or children to run their home.

- 2) Women who lacked interest, motivation, or did not perceive a need to attend even the initial nutrition education session.

- 3) Women who attended the initial nutrition education session, but did not attend subsequent sessions. Several reasons postulated are that women were expecting something other than what was presented, women did not feel a need for this type of program, or women were bored.

4) Women who attended sessions, more or less, until they won the lottery and then stopped participating.

5) Women who attended sessions quite regularly, once or twice a week. Possible reasons for attending sessions could be the social aspect, feeling of obligation to instructors and research personnel, or a belief that sessions were worthwhile in attending.

Instructors generally were very responsible, cooperative, and enthusiastic. From evaluation of instructors' performance in this program, it appeared that a background in the health field in addition to teaching experience was desirable. Furthermore, future nutrition education programs using local personnel should involve more preparation for instructors, using techniques such as mock teaching sessions as an example.

Regarding educational materials, greater improvement is necessary in adapting materials to local conditions. Although nutrition education material was derived primarily from a World Health Organization (WHO) publication, lessons were designed more for African rather than Latin American countries, although some participants were of African descent. Objectives, for instance, should be rewritten, as not all were suitable nor used for the Brazilian program. Topics generating the most interest and discussion were Breast Feeding, Importance of Food for Better Health, and Making Better Use of Available Resources. Other topics should be revised, deleted, or incorporated into the more successful topics. Audio visual materials such as pictures were generally suitable. Use of a nutrition

education game appeared successful, generating enthusiasm and participation. Incorporation of more activities such as games or perhaps demonstrations in future nutrition education programs of this nature, would be advisable.

In conclusion, barriers that appeared to affect participation and attendance in the nutrition program were weather (i.e. no rainfall), lack of interest or motivation, mental incompetency of a few women, illness, and negative interpersonal relationships among women. Motivating factors for women's participation may have been primarily for social interaction or to have a change from the home environment, with the desire to improve the family's situation or welfare as a less important factor.

A comparison of nutrition knowledge scores before and after the nutrition education program (Table 15) showed that two-thirds of post nutrition education program scores had improved. For scores showing no improvement, decrease in nutrition knowledge scores was minimal.

Statistical analysis of women's nutrition knowledge scores (n=18) before and after the nutrition education program was conducted to determine whether the program had any significant effect on nutrition knowledge. Wilcoxon signed ranks test was used on subjects' nutrition knowledge scores, with results reported in Table 15. Statistical analysis revealed that differences in scores were significant at $\alpha = .05$.

TABLE 15

Comparison of women's nutrition knowledge scores
pre - and post - nutrition education program

<u>Scores^a</u>		
Pre-Program	Post-Program	Difference ^b
10	15	+5
2	6	+4
10	20	+10
7	6	-1
3	4	+1
9	8	-1
8	19	+11
9	12	+3
9	11	+2
6	12	+6
4	15	+11
7	3	-4
5	13	+8
4	3	-1
4	11	+7
7	6	-1
5	11	+6
5	2	-3
Mean	6.3 ± 2.5	9.8 ± 5.4
Range	2-10	2-20
		-4 to +11

^a Based on maximum score of 25.

^b Differences in pre- and post - program nutrition knowledge scores were statistically significant at $\alpha = .05$, using Wilcoxon signed ranks test.

CHAPTER V

DISCUSSION

Findings from this study are compared, when possible, with findings from other relevant studies. Demographic and socioeconomic characteristics of the study population such as housing characteristics, food and health related practices, as well as women's attitudes/beliefs regarding food, infant feeding practices, dietary intakes, and anthropometry of women and children are compared to previous Brazilian studies of urban agricultural migrants or low socioeconomic groups. In addition, dietary intakes and anthropometric results are compared to international recommendations or standards.

1. Demographic and Socioeconomic Characteristics of Vila Diogo Residents

a) Household Size

Household size in Vila Diogo may be considered large, with about 50% of households reporting more than four persons per household. Whether the trend of having large families in Vila Diogo will continue, considering the number of women currently practising family planning, is not known. With Brazil's economic problems on one hand, and the economic value of large families in low socioeconomic groups on the other hand, it seems that Boias-Frias will continue to have large families. Furthermore, when women were asked what family size they currently regarded as appropriate, about

50% of respondents stated that families should be the same size as they had, with more than 25% of women indicating a larger family size.

b) Literacy Rate and Level of Education

Literacy rate and education level among Vila Diogo residents were low, with 33.9% of male and 45.0% of female household heads having no formal education. For Boias-Frias receiving formal education, maximum schooling was three or four years. Furthermore, the number of male household heads reporting three or four years of schooling was 1.5 times greater than female household heads. Similar differences between male and female household heads' literacy rates were also observed. Reasons for adults not receiving more than four years of schooling may be that fazenda schools did not offer higher grades, lack of interest by Boias-Frias, or lack of school facilities.

Of more concern is that less than one-half of Vila Diogo school age children were currently attending school. Reasons most frequently cited for children not attending school were that children were employed or children disliked school. Families probably still regard children as important contributors to family income. With a poor educational background, children in later life will probably have similar occupations and socioeconomic status as their parents.

Research findings indicate a positive correlation between health and nutrition and the amount of formal education (Daly et al., 1979). Reasons postulated for this positive correlation may be that increasing education results in better personal hygiene, improved child rearing, adoption of

better diets, increased income to buy more food, to cite a few (Daly et al., 1979).

c) Residential History

Vila Diogo was a well-established favela with a relatively stable population. Mean years of residency in the present home was 6.3 years, which did not include time spent in the same favela, but in another house. Furthermore, 25% of respondents were born and raised in Vila Diogo.

Migration in this population consisted primarily of relatively short distances; from Nuporanga or surrounding fazendas and cities. Reasons for residential changes within the favela may have been to obtain a more favourable location or house. Motives most frequently cited for moving to Vila Diogo were to earn more money and to obtain better medical services. Families previously living on fazendas, for instance, probably had limited access to health and education services. Furthermore, the possibility of earning more money as a seasonal agricultural labourer than a regular wage on a fazenda may have been the motivating factor in changing place of residency. The reason for moving to the favela from Nuporanga was probably economic, as rent and perhaps taxes for village services were likely beyond their means.

d) Employment

Employment stability is a major concern for Boias-Frias. Their earning power as agricultural labourers is dependent on factors such as weather, good health, amount of work performed, and good crops. Although

a minimum wage exists in Brazil, this does not apply to Boias-Frias.

Sick benefits are also not available. Health status for Boias-Frias, then, becomes very important in terms of potential income. Presence of helminthic infestation, inadequate diet in terms of energy and nutrients, infection, or poor health would decrease a labourer's physical capabilities, resulting in less work performed and less income. Several studies among physical labourers (Angeleli et al., 1983; Wolgemuth et al., 1982) have shown that dietary supplementation increased work performance.

Furthermore, many Vila Diogo households (62.5%) consisted of one wage earner. In these instances, if the wage earner is in poor health and has inadequate dietary intake which results in absenteeism from work or reduced work output, the consequences on the family could be nutritionally detrimental. An investigation of wages revealed that earnings for Boias-Frias were generally lower than current minimum wage.

Weather and crop yields are additional crucial factors affecting income. Rainfall not only prevents Boias-Frias from working in the fields, but excessive precipitation can be detrimental to crop yields. In 1983, excessive rainfall caused low cotton crop yields, resulting in less income for Boias-Frias who harvested the crops. Rain also prevents agricultural labourers from working in the fields, resulting in less income.

e) Housing Characteristics

A comparison of housing characteristics between rural Vila Diogo and the urban favela of Vila Recreio described by Swann (1979) indicates that perhaps housing conditions for Vila Diogo residents may have been somewhat

better than their urban counterparts. Although many Vila Diogo houses had earthen floors and insufficient number of windows for adequate lighting and ventilation, the size of houses, as determined by the number of rooms, was larger than reported for Vila Recreio. Furthermore, more Vila Diogo households had piped-in water than Vila Recreio, although the number of households with electricity was slightly less. Finally, all Vila Diogo respondents reported owning their own home, compared to 77% in Vila Recreio (Swann, 1979).

Sanitation in Vila Diogo was poor, the situation being similar to conditions reported by Swann (1979) and Waddell (1980) for Vila Recreio. Sewage disposal consisted of open gutters; garbage was usually disposed openly on yards or street, and toilet facilities were primarily yards or open gutters.

The unhygienic environment is an important factor affecting nutritional status, especially in children. Several Vila Diogo children, during the study, were admitted to hospital for removal of heavy worm loads such as Ascaris lumbricoides. Other parasitic infestations found among Vila Diogo residents, as reported by the local doctor, were Giardia lamblia, Ancylostoma duodenale or braziliense, Tenia saginata or solium, and Strongyloides stercoralis. Prevalence of parasitic infestation in Vila Diogo children is probably similar to a 60% infestation rate reported by Swann (1979) for Vila Recreio children. Improvements in sanitation would exert significant effects in improving nutritional status of Vila Diogo residents, especially in young children.

f) Women's Reproductive History

In this study, range of values for age at first menstruation varied from 10 to 17 years. Upper range of values for age at first menstruation may possibly have indicated the influence of poor nutrition. Malnutrition can affect biological maturation, manifesting itself in delayed onset of menarche (Anderson, 1975; Beaton and Bengoa, 1976).

A large percentage of respondents reported abortions, stillbirths, and infant deaths. Poor nutrition may be implicated as an underlying cause in the high percentage of fetal wastage reported by Vila Diogo women. Pregnancy is a physiological state requiring increased nutrients for growth of maternal and fetal tissues (Iyengar, 1975).

Animal studies have shown that nutrient deficiencies can result in fetal wastage and growth retardation in animals (Iyengar, 1975). In humans, Antonov (1947) found that physical hard work, mental stress, cold temperatures, and starvation in pregnant women during the siege of Leningrad resulted in an unusually high number of premature births, stillbirths, and high infant morbidity and mortality rates. A study of pregnant Gambian women by Thomson et al. (1966) found that strenuous physical labour and inadequate dietary intake resulted in weight loss during pregnancy and statistically non significant reductions in birth weights.

Another reason for the occurrence of stillbirths in the past could be due to fetal distress which might have been prevented by adequate medical care. Prior to the opening of Nuporanga hospital in 1965, infants were delivered in favela homes by Vila Diogo women.

Mean birth interval (2.3 yr) was calculated for respondents with more than one child under 5 years of age. Current birth intervals are perhaps greater than in the past because many women use oral contraceptives. Religion does not appear to exert any influence in family planning decisions, even though most respondents indicated Roman Catholicism as their religion.

A review by Huffman (1984) of studies conducted in developing countries, reported that birth intervals less than one to two years as being detrimental to the nutritional status of mother and child. This view is shared by Wishik and Stern (1975) who state that for women from low socioeconomic groups, a birth interval of one year still probably constitutes a nutritional risk for mother and child.

In summary, characteristics of this rural population such as large household size, low literacy rates and educational levels, low income, lack of job security and an unhygienic physical environment are indicators that individuals, especially children, are unlikely to exhibit optimum health and nutrition. Studies of other agricultural migrant workers with similar demographic and socioeconomic characteristics (Swann, 1979; Waddell, 1981) confirm these observations.

2. Food and Health Related Practices

a) Food Related Practices

Meal patterns of Vila Diogo households were similar to those reported by Swann (1979) and Waddell (1981) for Vila Recreio, with breakfast usually

consisting of coffee (with sugar) and perhaps bread; lunch and supper consisting of rice, beans, and sometimes a vegetable or salad. Many Vila Diogo women used gas as a cooking fuel, with an equal number of women using either wood or a combination of wood and gas. Although women reported walking long distances to gather wood at no cost, the economic advantages realized were important because the price of cooking gas doubled in June, 1983.

Food costs for Vila Diogo families, were probably comparatively less than reported by Swann (1979) for Vila Recreio. Food prices in Vila Recreio stores were an estimated 18% higher than in Ribeirao Preto city. Although food costs for Vila Diogo families may have been higher than Ribeirao Preto city, the difference was probably not 18%. Vila Diogo residents, therefore, may have economic advantages regarding food costs compared to their urban counterparts. Furthermore, many Vila Diogo households reported having some home-grown foods, unlike Vila Recreio households, who generally did not have gardens (Swann, 1979).

Changes in dietary habits were reported by about one-half of women who had migrated to Vila Diogo. Milk was the item most frequently reported as being consumed at the previous location, but not in Vila Diogo because of price. For households who previously lived on fazendas, milk was probably obtained free or at very low cost. Women now, however, reported eating vegetables, meat (including organ meat such as liver), and bread in Vila Diogo; foods which had not been as readily available at their former location. For many women, residential changes resulted in the availability of a more varied diet, however, in exchange for deleting a nutritious food

such as milk.

In summary, although food intakes are similar between rural Boia-Fria women in this study and urban Boia-Fria women described by Swann (1979), rural residents may have economic advantages compared to their urban counterparts regarding cooking fuel, food costs, and availability of fresh, home-grown vegetables.

b) Health Related Practices

Alcohol consumption among favela residents in this study was a problem, particularly among men. This finding was also observed by Desai et al. (1980) in urban favela dwellers. Women, generally, reported a dislike of alcoholic beverages, although one or two women may have had a drinking problem.

Smoking prevalence was higher among male and female household heads in Vila Diogo than reported by Desai et al. (1980) for urban favela dwellers of Vila Recreio. In Vila Diogo, more than 1.5 times as many men smoked as women, implying perhaps that smoking by women may not be as acceptable in Brazilian culture. Some young children smoked, although prevalence was difficult to determine because parents were often unaware of children's smoking practices.

The amount of money or percent of income spent on alcohol and cigarettes is not known; furthermore, accurate information regarding alcohol and smoking expenditures is frequently difficult to obtain. Money used in purchasing alcohol or cigarettes, however, could be used to purchase a larger quantity or variety of food supplies.

3. Nutritional Assessment

a) Dietary Intakes of Women

Although Boia-Fria women indicated a preference for a variety of foods, the actual diets on a daily basis were simplistic, consisting primarily of rice, beans, and coffee with sugar. Majority of respondents would consume meat, cheese, macaroni, fruit (such as avocado, banana, tangerine), soft drinks, ice cream, and vegetables such as sweet potato or manioc on a weekly or less frequent basis.

In this study, the main reason postulated for differences observed between women's food preferences and frequency of food consumption is economic. Evidence supporting this postulation is that almost one-third of women surveyed regarding what they would do or buy on winning the lottery indicated increasing the quantity of food purchased. Majority of women, however, indicated they would buy the same type of food currently purchased, but in larger quantity; about 25% of respondents reported they would buy more meat. That income is probably a major limiting factor in obtaining nutritionally adequate diets among Brazilian low income groups has been reported by others (Patrick and Simoes, 1971; Jansen et al., 1977; Ward and Amoni, 1980).

A diet consisting primarily of rice, beans, and coffee with sugar would not be expected to contain all the nutrients for good nutrition. This was verified by Swann (1979) who conducted dietary studies among Boias-Frias living in Vila Recreio, an urban favela of Ribeirao Preto city. Other studies (Basta, 1977; Jansen et al., 1977; Ward and Amoni,

1980; Thomas, 1982) reported, however, that nutrient intakes in rural areas were superior to urban centres.

Mean daily nutrient intakes of Boia-Fria women in this study were estimated using the 24-hour recall method. Since a previous study by Desai et al. (1980) reported that dietary intakes of Boias-Frias usually were different on Sundays, some interviews were conducted in this study to obtain dietary information for that particular day.

The 24-hour recall method has several limitations which have previously been discussed in Chapter II. Limitations such as memory and lack of representativeness of usual intake may be a lesser problem in Boia-Fria diets because of diet simplicity and similarity from day to day. Problems, however, such as accurately estimating serving size, overestimating portion sizes when intakes are low, or underestimating intake in expectation of receiving aid, could occur (Burk and Pao, 1980). The 24-hour recall method, itself, tends to underestimate intakes (Burk and Pao, 1980).

In comparing estimated mean daily nutrient intakes with intakes of Boia-Fria women living in an urban favela, Vila Recreio (Swann, 1979), results indicated that energy and nutrient intakes (except ascorbic acid) of Boia-Fria women in this study were higher. Estimated mean daily intakes of protein, fat, thiamin, riboflavin, and niacin were about 1.5 times and vitamin A was 4 times greater in Vila Diogo women than in Vila Recreio women.

Estimated mean vitamin A intakes for subjects in this study, however, were probably not indicative of usual intake because a few subjects had consumed foods high in vitamin A. Furthermore, foods rich in vitamin A

were not generally eaten on a daily basis. Foods high in a particular nutrient such as vitamin A are, therefore, not accurately portrayed by the 24-hour recall method because of daily nutrient variability (Beaton, 1975). Standard deviations varied greatly for mean protein, calcium, vitamin A, riboflavin, and ascorbic acid intakes. Mean values for these nutrients are, therefore, more prone to error in estimating true population means.

Estimated mean daily intakes of women were compared to FAO recommended intakes. Almost two-thirds and about one-tenth of women surveyed did not meet two-thirds and one-third of FAO recommendations, respectively, for energy intake. Energy intakes in this study population were higher than reported by Swann (1979) for women living in Vila Recreio.

Regarding nutrient intake, fewer Vila Diogo women than their urban counterparts in Vila Recreio did not meet one-third FAO recommendations for calcium, iron, riboflavin, and niacin, although the proportion of women not meeting one-third FAO recommended intakes for vitamin A and ascorbic acid were similar. Despite allowances for interindividual variation in collection of dietary data, it appears that intakes of energy and most nutrients are superior among women living in this rural favela than compared to women in the urban favela studied by Swann (1979).

Contribution of various food groups to nutrient intakes were relatively similar for Vila Diogo women and for urban Boia-Fria women described by Swann (1979). Energy sources were provided primarily by legumes (beans) and cereals (rice). Regarding protein intake, however, Vila Diogo women had more protein intake, than their urban counterparts, from animal and legume sources. Calcium intakes were similar for both groups of women,

primarily from legumes and cereals, and a small amount from dairy products. Iron sources were largely from legumes; ascorbic acid was primarily obtained from vegetables; α -tocopherol from legumes and cereals; and most thiamin, riboflavin, and niacin were obtained from animal sources, legumes, and cereals. Compared to Vila Recreio women, more vitamin A intake for Vila Diogo women originated from animal sources and less from vegetable sources. This may be due to the location of a chicken hatchery, abattoir, and meat shops in the vicinity of Vila Diogo.

1) Interpretation of Dietary Data

Interpretation of dietary data, whether for individuals or population groups, is difficult. Dietary data are usually compared to standards. Intakes below recommended levels, however, do not necessarily imply a deficiency (Health and Welfare Canada, 1983).

Standards have been derived from average requirements plus two standard deviations which will meet the needs of most healthy persons in a population (Health and Welfare Canada, 1983). Recommended intakes exceed requirements of most individuals, with few individuals requiring nutrient levels recommended by dietary standards. Population groups, therefore, with mean nutrient intakes below recommended levels may only have a few individuals who are actually deficient in specific nutrients (Scrimshaw, 1962; Committee on Food Consumption Patterns, 1981). Because dietary standards or allowances are derived from requirements of a healthy population, the presence of pathological conditions (which would increase nutrient requirements) such as infection, parasitic infestation, trauma,

psychological stress, genetic abnormalities, and neoplastic disease are not taken into account (Scrimshaw, 1962).

Researchers have frequently compared dietary intakes to two-thirds of recommended levels and used this value as a cut-off point for adequacy and inadequacy, although other cut-off points have been used (Burk and Pao, 1980). Beaton (1975), however, proposes that assessment of nutrient intake be regarded as the probability of deficiency risk rather than inadequacy. Intakes below recommended levels would indicate a possible greater risk that an individual or population groups have not met their requirements (Health and Welfare Canada, 1983).

Estimated mean daily protein intake of Vila Diogo women met FAO recommendations, although the large standard deviation indicated significant error in the mean value as being the "true" population mean. When individual protein intakes were compared with two-thirds and one-third FAO recommendations, approximately 33% and 5% of women did not meet two-thirds and one-third of FAO levels, respectively.

Energy intake is one of the factors, however, that must be considered in determining the risk of protein deficiency. If energy intake is low, protein will be utilized for energy. In this study, mean daily energy intake was less than recommended, with almost 67% and more than 10% of women, respectively, not meeting two-thirds and one-third FAO energy recommendations. A few women could, therefore, be at significant risk for protein deficiency and malnutrition if low intakes (less than one-third FAO levels) were continued. Other factors, furthermore, that can increase protein requirements include amino acid composition, protein digestibility,

illness, trauma, infection, and physiological conditions such as lactation and pregnancy (Harper, 1982).

Protein sources of Boia-Fria diets are predominantly legumes and cereals. It has been suggested that in low income populations where protein sources are mainly of plant origin (ie. poorer protein quality) and where a higher probability of infection and malabsorption exists, that protein intake should be 13 to 14% of total energy intake to ensure adequate coverage of most people (Scrimshaw and Lockwood, 1980). In this study, estimated mean protein intake accounted for 11% of total energy intake. Protein quality of the Boia-Fria rice and beans diet will be satisfactory, if consumed on a one to one ratio because the limiting amino acid of lysine in rice and methionine in beans are complemented. Protein status of Vila Diogo women may be marginal, with some women being at high risk for protein deficiency if pregnant, lactating, or ill.

Calcium intakes of Vila Diogo women were low, with almost 50% of women reporting intakes less than one-third FAO recommendations. Furthermore, the standard deviation for estimated mean daily calcium intake was high, indicating a significant error in estimating the "true" population mean. Daily calcium absorption may range from 10 to 60% although the body regulates calcium levels through urinary and fecal excretion, hormones, intestinal absorption, renal reabsorption, and bone resorption (Avioli, 1980; Robinson, 1980).

Low calcium intakes have been reported as well in other Brazilian low income groups (Jansen et al., 1977; Swann, 1979). Vila Diogo women appear to be at some risk for calcium deficiency, especially during periods of increased requirements such as pregnancy and lactation.

Iron intakes by Vila Diogo women appear very low, with about 90% and 50% of women not meeting two-thirds and one-third FAO recommended levels, respectively. Occurrence of iron deficiency anemia would be expected in a small percentage of women, with a large percentage of women at high risk for developing anemia. Biochemical studies by Swann (1979) of Boia-Fria women in Vila Recreio found about 25% had low hemoglobin values.

Iron sources for Vila Diogo women were similar to Vila Recreio women, being obtained primarily from non heme sources such as beans and rice. Iron bioavailability from non heme sources is low (1 to 5%), although dietary ascorbic acid and heme sources would increase iron absorption. Cooking utensils used by Vila Diogo women did not add to iron intake, although drinking water may have provided additional small amounts of ingested iron. Mean estimated amounts of iron absorbed may, therefore, be very low compared to FAO recommendations.

Furthermore, increased iron loss such as sweating, however, could be important factors influencing iron status for women working as field labourers. Menstrual losses could result in substantial iron loss, although many Vila Diogo women of child-bearing age used oral contraceptives. Finally, parasitic infestation could account for iron loss, although prevalence of parasites such as hookworm in adult Boias-Frias was not

known. Although iron absorption in iron-deficient individuals increases (ranging from 10 to 20%) (Beutler, 1980), subjects in this study are probably still at a high risk for developing iron deficiency anemia because increased iron absorption by the body will be insufficient to cover low dietary iron intake and iron losses.

Estimated mean daily vitamin A intakes of Vila Diogo women were very low, with about 90 and 73% of women not meeting two-thirds and one-third FAO recommended vitamin A intakes, respectively. Furthermore, standard deviation was high, indicating the estimated mean value of vitamin A intake was an inaccurate estimation of the true population mean. This result was explained by a few subjects reporting consumption of foods high in vitamin A.

Considering that intakes of vitamin A-rich foods among Vila Diogo women occurs infrequently, vitamin A liver reserves would probably be low or exhausted. Biochemical studies by Swann (1979) of Vila Recreio adults (male and female) found that 25% of subjects examined had low plasma vitamin A levels, indicating that vitamin A liver reserves were probably exhausted. Other studies of low socioeconomic groups, especially in north-eastern Brazil, have also found vitamin A intakes to be low (ICNND, 1965; Patrick and Simoes, 1971; Ward and Amoni, 1980).

Estimated mean daily intake of ascorbic acid in Vila Diogo women was less than one-half of FAO recommendations, with more than 65% of women not meeting one-third FAO recommended intakes. Similar findings were reported by Swann (1979) for Vila Recreio women, although mean ascorbic acid intake was slightly higher compared to Vila Diogo women. Considering that usually

dietary intakes of vegetables and fruits are low, Vila Diogo women are probably at relatively high risk for ascorbic acid deficiency. This risk is increased, furthermore, in women who smoke. Evidence has shown that for persons smoking less than 20 cigarettes per day, plasma ascorbic acid levels may be 25% lower than for non smokers (Health and Welfare Canada, 1983). Ascorbic acid requirements for smokers would, therefore, be even greater.

Mean estimated daily α -tocopherol intake, of all nutrients, was closest in meeting FAO recommendations, with only 27 and 5.4% of women not meeting two-thirds and one-third of FAO recommendations, respectively. Intakes of α -tocopherol for Vila Diogo women were much higher than for Vila Recreio women, with the majority of intake derived from rich sources such as legumes and cereals, and a smaller portion originating from oils.

Plasma α -tocopherol levels of almost all Vila Recreio women were at acceptable levels. Plasma α -tocopherol levels of Vila Diogo women would be expected to be adequate, with risk of α -tocopherol deficiency, therefore, being negligible for most women.

Intakes of thiamin, riboflavin, and niacin were low, although thiamin and niacin intakes of Vila Diogo women were generally superior to reported intakes in Vila Recreio (Swann, 1979). An explanation for low thiamin intake is that typical Boia-Fria diets are high in polished rice and low in meat. Riboflavin intake is very low because riboflavin-rich foods such as dairy and animal products are usually lacking in Boia-Fria daily intakes. Risk of riboflavin deficiency is, therefore, probably high. Niacin-rich sources are varied, including dairy products, animal protein, grains, and

vegetables. A significant contributor of niacin for Vila Diogo women was coffee, which accounted for 13.1% of total niacin intake.

To summarize, Boia-Fria diets were simplistic, and nutritionally inadequate. Low income appeared to be a major limiting factor in obtaining nutritionally adequate diets. Nutrients which Vila Diogo women appeared most at risk regarding deficiencies were vitamin A, iron, calcium, ascorbic acid, and riboflavin.

2) Recommended Dietary Improvements

Any recommendations for dietary improvements should consider the cultural background and income of subjects, and physical availability of food. Furthermore, suggested dietary improvements should build on the existing positive elements of the diet.

Staple foods of Brazilian diets are beans, rice, and coffee (consumed with sugar). Although many varieties of beans exist in Brazil, about 20 varieties are mainly used for consumption, with certain varieties of beans being more popular in different geographical areas (Francois and Sizaret, 1981).

In recent years, Brazilian production of beans has not met consumption demand. The most common problem in increasing domestic production of beans is that any available arable land is used for export crops such as soybeans, coffee, and sugar (Francois and Sizaret, 1981). Furthermore, attempts to introduce soybeans into Boia-Fria diets have been relatively unsuccessful due to soybean's taste and cooking qualities (Wright, 1982).

The staple diet of rice and beans has been described as ideal, especially for low income groups who cannot afford daily intakes of animal protein (Francois and Sizaret, 1981). Shortages of energy and protein intake by Vila Diogo women could probably be met, income permitting, by increasing quantity of rice and bean consumption. If availability of beans becomes more of a problem in the future, more people might switch to less nutritious wheat products such as macaroni (Francois and Sizaret, 1981).

Another serious concern is the lack of vegetables and fruits in diets of Vila Diogo women. Physical availability of a variety of fresh fruit and vegetables in Nuporanga stores is relatively low and probably too expensive for Vila Diogo residents. Women may rely more on local truck vendors for vegetables of better quality and price. Many Vila Diogo women have home gardens to some extent, and these attempts at domestic food production should be encouraged, as well as emphasizing consumption of locally grown fruit.

Consumption of dairy products among Vila Diogo women is low. Of the dairy products available, fresh milk would be the most economical. Lactose intolerance in Boias-Frias has not been reported to be a problem (Desai et al., 1980), and increasing milk consumption should, therefore, be encouraged. Milk consumption would especially be beneficial in increasing energy, protein, vitamin A, and riboflavin intakes.

Availability of organ meat in Nuporanga was probably greater than in the small Vila Recreio stores. Contrary to previous reports (Desai et al., 1980), organ meat such as liver is not totally rejected in Boia-Fria diets because some intake was reported in Vila Diogo. Because the price of organ

meat is presumably less than other meat and because of its nutritional value, intakes of organ meat should be emphasized. Although consumption of poultry is infrequent, the Brazilian practice of incorporating chicken blood into the cooking of poultry should be encouraged.

Coffee with sugar is regarded by Brazilians as an important cultural beverage. This beverage cannot be totally disregarded as a non nutritious food because coffee provided a significant proportion to niacin intake. Sugar used by Boias-Frias in this study was not very refined and, could, therefore, contain some trace minerals.

Enrichment and fortification of Brazilian foods such as bread and macaroni have often been suggested. This suggestion, however, does not appear realistic for the Vila Diogo population because consumption of these foods are infrequent due to cost and perhaps some degree of cultural unacceptability.

In conclusion, Vila Diogo women should be encouraged to consume more fresh fruit and vegetables, dairy products, and organ meats. Families, for instance, could be encouraged to grow more produce. Government programs for food enrichment or fortification, such as enriched wheat products (eg. bread, macaroni) would be of little value to this population, who, financially, are unable to purchase these items on a regular basis.

b) Dietary Intakes of Children (2 to 5 years)

When dietary intakes of Vila Diogo children were compared to women's intakes, a larger percentage of children met FAO energy and nutrient recommendations, especially for energy, protein, thiamin, and riboflavin.

Estimated mean intakes for iron were low, with non heme sources such as beans being the primary source. Estimated mean ascorbic acid intake was also low due to lack of fruit and vegetable consumption. A large standard deviation for estimated mean vitamin A intake, indicated that, although mean intake was higher than FAO recommendations, a few subjects had consumed vitamin A-rich foods. Mean calcium intake appeared satisfactory, due primarily to milk consumption, although a relatively large standard deviation implied that some children had consumed little or no milk during the time period surveyed. Estimated mean protein intakes generally met FAO recommendations, with intakes being about equally derived from meat, rice and milk. Source of energy intake was primarily from rice. Milk consumption accounted for the satisfactory intakes of thiamin and riboflavin, and a significant proportion of all vitamin A intake.

Considering that children's nutrient requirements are high due to rapid growth, inadequate nutrient intakes plus other factors such as infections, illness, or parasitic infestation, could adversely affect growth and health. Comparison of estimated mean energy and nutrient intakes with FAO recommendations indicate that one-third of children had mean energy and riboflavin intakes and one-half of children had calcium, iron and α -tocopherol intakes less than two-thirds FAO recommendations, with more than three-quarters of children not meeting two-thirds FAO levels for vitamin A, niacin, and ascorbic acid. One-quarter and one-half of children had mean vitamin A and ascorbic acid intakes, respectively, less than one-third of FAO recommendations.

A number of children may have been at some risk regarding low energy intakes, although a proportion of protein intake may have been used for energy purposes. Children, generally, would appear to be at high risk for developing iron deficiency anemia, for having low liver vitamin A reserves, if any, and for being deficient in ascorbic acid.

Improvements in dietary intake are similar to those suggested for Vila Diogo women. Suggested changes include increasing energy intake, milk consumption, fruit, dark green and yellow vegetables, and heme iron sources (organ meat, other meat). Dietary improvements are necessary if catch-up growth is to occur in children who are stunted in growth.

c) Infant Feeding Practices in Vila Diogo

All children under the age of 5 years who participated in this study had been breast fed at birth. A general trend in developing countries, however, is a decline in breast feeding, especially in urban centres (WHO, 1981).

A study conducted in Pelotas, a southern Brazilian city, found that 24.0% of infants from low socioeconomic families were not breast fed at birth (Sousa et al., 1975). Furthermore, studies in southern Brazil indicated that the majority of infants had been weaned by the second month (Sousa et al., 1975; Schmidt et al., 1980). In the present study, 63.1% of infants had already been weaned by the third month.

A comparison of weaning practices in Vila Diogo with Vila Recreio revealed 73.6% of Vila Diogo infants had been weaned after 6 months, compared to 30% for Vila Recreio infants (Desai et al., 1980). At the end of

18 months, all infants in this study had been weaned. Differences noted in weaning practices between subjects in this study and those reported by Desai et al. (1980) are contrary to general trends reported in the literature of declining weaning age in rural and especially urban low socioeconomic groups. Differences in weaning age between Vila Diogo and Vila Recreio infants could be due to the presence of more working mothers in Vila Diogo than Vila Recreio. It is assumed that working women (eg. field labourers) would terminate breast feeding at an earlier age compared to women who are not employed. Furthermore, Nuporanga State Health Post offered free milk powder to Vila Diogo infants who were not growing well. This may have provided an incentive for women to terminate breast feeding at an earlier age. Distribution of free milk powder to Vila Recreio infants has not been reported.

The breast milk supplement or substitute used by majority of women was powdered milk. Since illiteracy among women was high, directions for preparation of milk were probably not known nor followed. Furthermore, the cost factor may have resulted in women preparing milk of a weaker strength. Other problems mentioned in the literature regarding infant formula preparation in developing countries are the lack of facilities for cleaning bottles, improper technique, and unhygienic environment, resulting in highly contaminated infant formulas (WHO, 1981).

Practices of introducing non milk foods in Vila Diogo appear more favourable than those reported by Desai et al. (1980) for Vila Recreio. Sugar water, coffee (with sugar), and soft drinks were not introduced to infants' diets during the first month of life, although 25% of infants were

given herb tea (with sugar). In contrast, 80% of Vila Recreio women reported feeding infants sugar water and herb tea (with sugar) during the first week of life; 60% of Vila Recreio women were feeding infants gruel (manioc flour or cornstarch and water), coffee (with sugar), and soft drinks within two weeks after birth. In Vila Diogo, only a small percentage of women used gruel as a weaning food. General recommendations for infant feeding state that foods other than milk are not necessary until the third or fourth month of the infant's life (WHO, 1981).

Age at which solid foods were introduced to Vila Digo infants was similar to practices reported by Desai et al. (1980) for Vila Recreio. No solid foods such as bread, vegetables, cereals, or meat were given to infants less than one month of age; by one year of age, most infants were eating the regular family diet.

Infant feeding practices changed significantly during illness, and were nutritionally detrimental. For infants with fever, many were only given liquids. Majority of mothers did not give infants anything to eat or drink, gave only liquids, or purges when infants had diarrhea.

Earlier thoughts on treatment of diarrhea involved fasting, thereby allowing the bowel to rest. Subsequent research, however, found that feeding did not increase duration of diarrhea, and nutrient absorption was still possible (Synderman, 1980). These observations resulted in the recommendation of feeding during diarrhea. Use of starvation in treating infantile diarrhea among low socioeconomic groups in developing countries can be particularly detrimental for the infant's nutritional status, which may already have been less than optimum before diarrhea occurred.

d) Women's Attitudes and Beliefs Regarding Illness and Food

An investigation of food taboos and other beliefs regarding food and origin of illness found a significant number (30%) of women did not know what could cause illness, although more than 16% of respondents cited health related reasons such as insufficient food, drinking contaminated water, and an unhygienic environment. Belief in the "hot-cold" theory of illness was still prevalent, with more than 20% of women reporting that changes in weather, consumption of cold (temperature) foods and drinks, or exposing one's hot body to the wind, could cause illness.

Many women reported that special foods such as meat and fruit, as well as milk and vitamin supplements, were important during pregnancy for fetal nourishment. Women recognized and reported a relationship between maternal dietary intake and fetal nourishment. These observations are contrary to those reported by Desai et al. (1980) for Vila Recreio women, who indicated that no special foods were necessary during pregnancy and lactation.

Many food taboos reported by Vila Diogo women were related to the "hot-cold" food classification still prevalent in Latin America. Illnesses or physiological conditions are classified as hot or cold, with treatment consisting of foods or medicaments opposite in classification (Sanjur, 1982). Menstruation, pregnancy, lactation, and post partum are considered hot conditions, and hot foods such as cabbage, onions, beans, pork, cereals, alcohol, and peppers would be avoided (Harwood, 1971; Molony, 1975; Desai et al., 1980). Examples of cold foods are oranges, herb tea, lettuce, milk, and tomato (Harwood, 1971; Molony, 1975; Desai et al., 1980).

Majority of women (75%) reported food taboos such as cold temperature foods and drinks, ice, meat (especially fish), red pepper, onions, cabbage, and acidic foods (citrus fruit) during menstruation. Whether women still rigidly adhere to these taboos is not known.

Fewer women reported food taboos during pregnancy. Reasons cited for taboos such as alcohol and red pepper were that pepper would cause colic or red colour in the newborn; alcohol would cause birth defects or red colour. A few women recognized the potential danger of maternal alcohol consumption on the fetus. Whether this knowledge was a result of attending prenatal classes was not investigated. These findings are contrary to those reported by Desai et al. (1980) for some Vila Recreio women who believed that hot foods such as rice, beans, onions were undesirable during pregnancy.

More than one-third of Vila Diogo women reported taboos during lactation, such as red pepper, fish, other meat, and acidic fruits. Very few Vila Recreio women, however, reported food taboos during lactation (Desai et al., 1980).

Almost 75% of Vila Diogo women reported that a wide variety of foods should be avoided immediately post partum. Reasons for taboos were sometimes not known; however, some women stated food taboos were necessary because the mother was physically weak. These taboos, if observed, could be nutritionally detrimental to the mothers. With most deliveries now occurring in hospital, however, these taboos are probably no longer practised.

From findings reported by Desai et al. (1980), it seems that as Boias-Frias move to urban centres, fewer women may remember and/or practise

various food taboos. Some modification of food taboos in Vila Diogo have probably already occurred as a result of most newborns being delivered in hospital rather than favela homes. With continued health education programs such as prenatal classes, more potentially detrimental food taboos may be eventually rejected.

e) Anthropometric Status of Women

Mean height, weight, triceps skinfold thickness (TSF), mid-upper-arm circumference (MUAC), and mid-upper-arm muscle circumference (MUAMC) of Vila Diogo women were similar to Vila Recreio women, as reported by Swann (1979). Weight for height of Vila Diogo women were compared with National Centre for Health Statistics (NCHS) percentiles. This index has been recommended as useful in indicating present nutritional level.

A large percentage of women (62.4%) had weight for height values below the NCHS median (50th percentile), with 25.0% below the 5th percentile. This would indicate that women are probably undernourished.

More than one-third of Vila Diogo women (37.6%) had weight for height at the 50th percentile or greater, implying normal or above normal weights. A small percentage of women (6.3%) had weight for height above the 90th percentile, indicating the presence of obesity. Overweight and obesity may occur as a result of excessive energy intake, insufficient exercise, metabolic disorders, or weight gain after successive pregnancies. In Vila Diogo, women who were obese usually were not agricultural labourers, but led a sedentary lifestyle. Garn and Clark, as reported by Richardson (1980) note a trend for low socioeconomic women to become more obese than

women of higher socioeconomic groups.

TSF measurements of Vila Diogo women revealed that 10.0% had TSF values below the 5th percentile. Low TSF values indicate that little energy reserves, as fat, exist. A small percentage of women would probably have little subcutaneous fat for energy reserves.

Calculation of MUAMC, using TSF and MUAC values, can indicate state of muscle development. Poor muscle development or muscle wasting indicates malnutrition, whereas a large muscle mass implies increased use of certain muscle groups (Jelliffe, 1966).

Muscle development was satisfactory for most Vila Diogo women, with 12.5% of women having MUAMC values greater than the 95th percentile. No values were below the 5th percentile. The relatively large number of women with significant muscle development (greater than 95th percentile) is probably for women who were agricultural labourers.

f) Anthropometric Status in Children

Height, weight, and head circumference (HC) of Vila Diogo children under 5 years were compared to NCHS percentiles (derived from Health and Nutrition Examination Survey (HANES), 1971-1975) and Marcondes' 50th percentile (derived from a Sao Paulo survey, 1971). HANES data were obtained from a sample representative of the USA population by age, sex, race, income, and region; Marcondes' sample was derived primarily from low socioeconomic groups (Murphy and Michael, 1982; Marcondes et al., 1971). Comparison of Vila Diogo children's anthropometric measurements with Brazilian standards would, therefore, present a more favourable image

regarding growth because children from low socioeconomic groups would probably exhibit varying degrees of poor nutrition. Although use of local anthropometric reference standards are desirable, standards ideally should be developed using healthy, well-fed subjects from upper socioeconomic groups (Jelliffe, 1966).

When weight for age of Vila Diogo boys and girls were compared to NCHS percentiles, 25% of boys and 10% of girls had weight for age less than the 5th percentile. These results imply that numerous boys and a few girls could be undernourished. Weight for age index, however, overestimates the number of malnourished because the index does not account for children small for size (Richards, 1980).

Weight for height index, on the other hand, considers weight in relation to frame size. When weight for height was used, 15.4% of boys and no girls had weight for height values below the 5th percentile; only a small percentage of boys, therefore, could probably be considered as undernourished.

Height for age index is an indicator of past nutrition. A large percentage of boys (46.2%) and girls (31.6%) had height for age values below the 5th percentile. A significant percentage of boys and girls could, therefore, be considered stunted. Stunting has been described as a physiological adaptation to low nutrient intake in an effort to conserve available energy (Richardson, 1980). Whether these children will remain stunted in later life will depend on whether catch-up growth occurs, and to what degree. Reasons for stunting may include inadequate dietary intake, infection, parasitic infestation, or illness. The degree to which catch-up

growth is completed will depend on the timing, degree, and duration of malnutrition (Fomon, 1974). These results are similar to those found by Dorea et al. (1982) for preschool and school children in northeastern Brazil, where weight for height was adequate, but where stunting (height for age) had occurred. From other anthropometric studies conducted in Brazilian children under 5 years of age, it appears that Vila Diogo children are better nourished than children in certain cities in northeastern and northern Brazil (Filho et al., 1981). Stunting, observed in Vila Diogo children under 5 years of age, was also reported by Desai et al. (1981) for Vila Recreio children. Comparison of weight for age values between Vila Diogo and Vila Recreio children, however, seemed to indicate higher values, generally, for Vila Diogo children than for Vila Recreio children.

TSF thickness, MUAC, and calculated MUAMC values in Vila Diogo children were generally normal, indicating fairly adequate fat reserves and no muscle wasting. Although MUAC and MUAMC values for Vila Diogo and Vila Recreio children appeared similar, Vila Diogo children, generally, appeared to have higher TSF thickness measurements than in Vila Recreio children (Desai et al., 1981).

For Vila Diogo children less than 3 years of age, 62 and 15% of boys and 55 and 27% of girls had HC less than 50th and 5th percentiles, respectively. Head growth occurs most rapidly during the first few years of life. Any nutritional deprivation would, therefore, be reflected in size of head circumference.

HC values of Vila Diogo children indicates that some nutritional deprivation has or is occurring. These observations are confirmed by comparing 50th percentiles of NCHS and Marcondes' references, where NCHS references are derived from healthy, relatively high socioeconomic groups compared to lower Marcondes' values derived from low socioeconomic groups that are probably nutritionally deprived.

4. Nutrition Education Program

Few reports of nutrition education programs among Brazilian low socioeconomic groups have been published. Wright (1982) used two education approaches (lecture and discussion/decision) to introduce soybeans into agricultural migrants' diets. Drummond (1975), using Freire's philosophy of education, conducted a nutrition education program in northeastern Brazil among low socioeconomic groups. Community meetings were held to discuss various health and nutrition problems existing in the communities.

In this study, nutrition education was considered the most appropriate nutrition intervention strategy in view of the limited research resources of time and finances and the demographic/socioeconomic characteristics of the study population. The low socioeconomic status of Vila Diogo residents, compounded by high national inflation, job insecurity, and lack of government programs to aid low socioeconomic groups, provided justification for implementing a nutrition education program that would focus attention, for example, on how people could maximize use of scarce resources. It has been reported that improving nutrition knowledge, using nutrition education, can

be a means whereby the poor can learn how to achieve maximum benefits from limited resources (Al-Isi et al., 1975).

The 10 weeks allotted for the nutrition education program were recognized as too brief to expect changes in nutrition attitudes/beliefs and nutrition practices in Vila Diogo women (target group), but changes in nutrition knowledge were anticipated. Nutrition attitudes, beliefs, and practices are an integral part of culture and are subject to change even as culture, itself, changes. This change process, however, may be relatively slow.

Nutrition education's goal has often been erroneously regarded as only to change nutrition behaviour or practices (Kolasa, 1981). Nutrition education, however, may be used to emphasize or reinforce positive nutrition behaviour currently practised by the target group. In Vila Diogo, evidence that all young children commenced breast feeding at birth, that many women had home gardens, and women's beliefs that alcohol consumption during pregnancy could be detrimental to the fetus, were positive nutrition practices and beliefs that should be emphasized and reinforced. Other evidence such as inadequate nutrient intake, nutritionally detrimental infant feeding practices, stunted growth in children, potentially nutritionally detrimental attitudes/beliefs and low nutrition knowledge scores indicated that nutrition education topics such as breast feeding, infant feeding practices during illness, importance of eating a variety of foods, and maximizing use of available resources, should be presented.

The philosophical approach to nutrition education in this study was the "banking" method as described by Freire (1981). A more desirable

approach proposed by Freire (1981), where program participants would analyze their situation, identify problems, and suggest solutions, was not attempted in this study because time was limited, instructors were unfamiliar with this method, and the primary investigator had a limited command of the local language. This method, involving participants in the development and implementation of a nutrition education program, has been described as the most successful means of changing nutrition behaviour (Gussow and Contento, 1984). If this problem-solving approach were to be attempted with this population, discussions should involve male household heads as well as women. In Brazilian society, the male role is regarded as dominant. Program success might be assured if men were involved in problem identification and decision-making.

Overall participation by women in the nutrition education program was fair (46.4%). Mean age of women who participated was slightly higher than for non participants (43.0 vs. 37.7 years). Reasons postulated for non participation were: Two or three women were mentally incompetent, one woman was physically disabled, one woman refused to pass through the favela, and a number of women were field labourers who worked every day except Saturday (and may have been too busy or tired to attend). For the remaining women who did not participate, reasons were unknown.

Although many participants were older women, nutrition education may be valuable if older women are a source of information to their daughters. Some evidence that this might be true was revealed in reasons given for food taboos. In a few instances, reason cited for a food taboo was that the elders had stated taboos were necessary or important.

Although women rather than children were the target group of nutrition education, children attended nutrition education sessions and were enthusiastic participants. Future nutrition education programs for low socioeconomic groups should, perhaps, consider including children as a target group. Involving children in appropriate nutrition education programs could affect children by increasing nutrition knowledge and possibly cause changes in nutritionally detrimental attitudes/beliefs and behaviours as children grow older and eventually have their own families.

Evaluation of the nutrition education program in Vila Diogo consisted of two components; formative and summative evaluation. Frequently, insufficient attention has been focused on formative evaluation. Advantages of evaluating programs during the implementation and operational phases are that any problems or shortcomings can be quickly identified and corrected during the program, preventing errors from recurring. In this study, formative evaluation was of value in identifying problems of attendance, length of sessions, manner of presentation, and participants' response.

Summative evaluation consisted of a written evaluation and statistical analysis of nutrition knowledge scores. Statistical analysis of nutrition knowledge scores before and after the nutrition education program, using Wilcoxon signed ranks test, indicated that improvement in scores was statistically significant at $\alpha = .05$.

Does statistical significance, however, necessarily imply any practical significance? Hennigan et al. (1979) state that even though changes may be statistically significant, changes may be too small to make any practical difference in people's lives. In this study, statistical

significance in improved nutrition knowledge scores was unlikely to have any real effect on women's lives. Furthermore, bias created as a result of a large percentage of non participants would prevent speculation that an increase in nutrition knowledge scores could be predicted for other similar populations. If one disregards the issue whether nutrition education had any practical significance for Vila Diogo women, and in spite of bias resulting from a large proportion of non participants, nutrition education did result in improving nutrition knowledge for women who attended the program.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

1. Summary

A nutritional needs assessment was conducted among rural agricultural migrant women (target group) and children (less than 5 years). The study was conducted in Vila Diogo, a slum located on the periphery of Nuporanga, a village in Sao Paulo state, Brazil.

A nutrition education program was designed on the basis of evidence obtained from demographic/socioeconomic information of the study population and a nutritional needs assessment of women (target group) and children less than 5 years of age. The nutritional needs assessment consisted of anthropometry, dietary assessment, and nutrition knowledge, attitudes, and beliefs questionnaires. Formative and summative evaluation of the nutrition education program, using appropriately selected criteria and comparisons of nutrition knowledge scores before and after the program, were used to determine program effectiveness.

Objectives of the study were:

- 1) To obtain information on demographic characteristics, socioeconomic situation, food and health related practices of favela residents (study population) by questionnaires addressed to the target group.

- 2) To conduct a nutritional needs assessment of the target group and their children age 5 years of age or less:
 - a) Determining nutrient intake of the target group and their children over 2 and up to 5 years of age, using 24-hour food recalls addressed to the target group.
 - b) Comparing nutrient intakes of the target group and children over 2 and up to 5 years of age with internationally recommended nutrient intakes.
 - c) Obtaining information on infant feeding practices, using questionnaires addressed to the mothers.
 - d) Determining food preferences and frequency of food intake of the target group, using questionnaires.
 - e) Determining the nutrition knowledge and attitudes of the target group, using questionnaires.
 - f) Determining the anthropometric status of the target group and children under 5 years of age, using selected physical measurements.
 - g) Comparing anthropometric measurements of the target group and children under 5 years of age with international and Brazilian standards.
- 3) To design and implement an appropriate nutrition education program for the target group, using information obtained from the nutritional needs assessment.

- 4) To conduct a formative evaluation of the nutrition education program, using appropriately selected criteria.
- 5) To determine the impact of the nutrition education program on nutrition knowledge of participants by comparing nutrition knowledge questionnaire scores before and after the nutrition education program.

Major findings of the study were:

- 1) Diets of Vila Diogo residents were generally simplistic, consisting primarily of rice, beans, and coffee with sugar.
- 2) Vila Diogo women appeared to be at a relatively high risk for vitamin A, iron, calcium, ascorbic acid, and riboflavin deficiencies, based on comparisons of 24-hour dietary intake data with FAO recommendations.
- 3) Children (2 to 5 years) appeared at high risk for vitamin A, iron, and ascorbic acid deficiencies, based on comparisons of 24-hour dietary intake data with FAO recommendations.
- 4) All children less than 5 years of age had been breast fed at birth, but more than one-half of children had been weaned by the third month.

- 5) Infant feeding practices during fever and diarrhea were nutritionally detrimental.
- 6) Women generally recognized a relationship between dietary intake during pregnancy and fetal nourishment.
- 7) Using weight for height index, a significant number of women were probably undernourished; a small percentage of women, however, were overweight or obese.
- 8) Although children less than 5 years of age did not generally appear malnourished, a relatively large number were stunted in growth.
- 9) Although Vila Diogo women reported many food taboos during various physiological states (menstruation, pregnancy, immediately post partum, lactation), relatively few food taboos had potentially negative nutritional consequences.
- 10) For women who participated in the nutrition education program, nutrition knowledge scores after the program showed improvement which was statistically significant at $\alpha = .05$, using Wilcoxon signed rank test.

2. Recommendations

On the basis of results obtained from this study, the following recommendations for further investigation or action are presented:

- 1) Comparing dietary intakes between rural and urban Boias-Frias during a similar time frame.
- 2) Comparing the effectiveness of a nutrition education program between rural and urban Boia-Fria women.
- 3) Designing and implementing a nutrition education program for Boia-Fria children.
- 4) Comparing weaning age between rural and urban Boia-Fria children.
- 5) Revising nutrition education material used in this study to make it more appropriate for Boias-Frias.
- 6) Investigating whether food attitudes/beliefs change, and to what extent, when Boia-Fria women move from a rural to an urban setting.
- 7) Investigating decision-making within the home: how money is spent, who controls finances, who is involved in the decision-making process.

- 8) Investigating how food is distributed within the home.
- 9) Comparing sources of health and nutrition information for Boias-Frias women living in rural and urban favelas.
- 10) Investigating how additional income would actually be used compared to reported use.
- 11) Investigating whether Boia-Fria men tend to marry Boia-Fria women and remain in the favela; whether Boia-Fria women tend to marry men other than Boias-Frias (to increase socioeconomic status), and the nutritional implications for adults and children.
- 12) To encourage use of mass media (eg. posters, television) by State Health Posts for promoting positive nutrition practices such as breast feeding, cultivation of home gardens, to cite a few.
- 13) Using the methodology of Freire, to conduct a nutrition education program among Boias-Frias living in Sao Paulo state.
- 14) Investigating reasons for women engaging in positive nutrition practices such as breast feeding, family planning, and cultivating home gardens, and using this information in planning future nutrition intervention programs.

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]. CONSENT FORM FOR BOIA-FRIA WOMEN

2. CONSENT FORM FOR FATHER OR GUARDIAN

VERBAL RESPONSE: YES OR SIGNATURE: _____
NO DATE: _____

APPENDIX B

DEMOGRAPHIC/SOCIOECONOMIC/FOOD & HEALTH-RELATED

DATE:
CODE NO:
SURNAME:

PRACTICES QUESTIONNAIRE

1. NAME ALL PERSONS WHO EAT AND SLEEP IN THIS HOUSE EVERY DAY.

NAME	SEX 1=M 2=F	RELATIONSHIP TO HOUSEHOLD HEAD	AGE	DATE OF BIRTH	CURRENTLY IN SCHOOL? YES NO	IF NO, WHY NOT?	YEARS OF SCHOOLING	ABILITY TO READ READ NEWSPAPERS/ WRITE LETTERS
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01

02

03

04

05

06

07

08

09

10

2. HOW LONG HAVE YOU LIVED AT THIS ADDRESS?

3. DID YOU VOTE IN THE LAST ELECTION? YES NO WHY?

FATHER
MOTHER
CHILDREN

4. WHERE DID YOU LIVE BEFORE MOVING TO THIS HOUSE?

MUNICIPALITY
CITY
STATE

5. WHY DID YOU DECIDE TO MOVE TO NUPORANGA?

1) TO EARN MORE MONEY
2) TO GET A BETTER JOB
3) BETTER HEALTH CARE
4) TO JOIN OTHER FRIENDS, PARENTS, FAMILY
5) OTHER (SPECIFY)

6. WHAT KIND OF WORK DID (FATHER, MOTHER, CHILDREN) DO THIS PAST MONTH AND WEEK

PAST MONTH PAST WEEK

FATHER
MOTHER
CHILDREN

7. HOW MUCH DID (FATHER, MOTHER, CHILDREN) GET PAID THE LAST TIME AND WAS THIS MONEY FOR A DAY, WEEK, OR MONTH?

AMOUNT TIME INTERVAL

FATHER
MOTHER
CHILDREN

8. DID (FATHER, MOTHER, CHILDREN) RECEIVE A BONUS IN DECEMBER? IF YES, HOW MUCH MONEY WAS RECEIVED?

YES NO AMOUNT

FATHER
MOTHER
CHILDREN

9.1 AGE OF FIRST MENSTRUATION . . .

9.2 AGE AT FIRST PREGNANCY . . .

9.3 NUMBER OF SPONTANEOUS ABORTIONS . . .

9.4 NUMBER OF STILLBORNS . . .

9.5 NUMBER OF CHILDREN BORN ALIVE . . .

9.6 NUMBER OF CHILDREN BORN ALIVE WHO LATER DIED . . .

9.7 AGE OF CHILDREN WHEN THEY DIED . . .

10. ARE YOU NOW:

PREGNANT
LACTATING
PREGNANT AND LACTATING
NONE OF THE ABOVE

11. DO YOU USE ANY BIRTH CONTROL? YES NO
 IF YES, WHY?
 IF NO, WHY NOT?
 1) CONTRACEPTIVES ARE NOT AVAILABLE
 2) HAVE NEVER THOUGHT ABOUT USING BIRTH CONTROL
 3) RELIGION FORBIDS USE OF BIRTH CONTROL
 4) HAVE NEVER HEARD ABOUT BIRTH CONTROL
 5) DON'T KNOW WHO TO ASK ABOUT BIRTH CONTROL INFORMATION
 6) OTHER (SPECIFY)
12. THINKING ABOUT COUPLES MORE OR LESS LIKE YOURSELVES, HOW MANY CHILDREN WOULD BE A GOOD NUMBER FOR THEM TO HAVE NOWADAYS?
13. RELIGION
 CATHOLIC
 SPIRITUAL
 PROTESTANT
 NONE
 OTHER (SPECIFY)

HOME ENVIRONMENT

14. HOUSE: RENTED OWNED OTHER (SPECIFY)
 NUMBER OF ROOMS IN HOUSE:
 NUMBER OF WINDOWS IN HOUSE:
 TYPE OF WINDOWS: OPEN (WITH SHUTTERS) SCREENED OTHER(SPECIFY)
 CONSTRUCTION OF HOUSE (TYPE OF MATERIAL):
 ROOF
 WALLS
 FLOOR
 ELECTRICITY: YES NO
 SOURCE OF WATER: RUNNING WATER IN THE HOUSE FROM A WELL VILLAGE WELL
 BUY WATER FROM A VENDOR OTHER (SPECIFY)
 SEWAGE DISPOSAL: OPEN GUTTER CLOSED GUTTERS OTHER (SPECIFY)
 GARBAGE DISPOSAL: PUBLIC COLLECTION GARBAGE TINS OPEN YARD
 WHAT TOILET FACILITIES ARE MOST OFTEN USED BY YOUR FAMILY?
 VILLAGE LATRINE TOILET IN HOUSE OUTSIDE LATRINE
 GUTTERS OPEN FIELDS OR GROUND OTHER (SPECIFY)
 WHERE DO YOU DO YOUR COOKING?
 OUTSIDE THE HOUSE INSIDE THE HOUSE OTHER (SPECIFY)
 WHAT KIND OF COOKING FUEL DO YOU USE?
 WOOD GAS CHARCOAL OTHER(SPECIFY)
 WHICH OF THE FOLLOWING ITEMS DO YOU HAVE?
 TELEVISION RADIO SEWING MACHINE CASSETTE PLAYER
 RECORD PLAYER IRON PRESSURE COOKER FAN
 MIXER BLENDER REFRIGERATOR
 DO YOU HAVE ANY ANIMALS/PETS? (STATE NUMBER)
 DOG CAT BIRDS PIG CHICKEN OTHER (SPECIFY)
 HOW ARE ANIMALS FED?
 FROM FOOD IN THE HOUSE WHATEVER FOOD THEY CAN FIND
 OTHER (SPECIFY)

FOOD HABITS & PRACTICES

15. IN THE PAST WEEK, WHERE DID YOU GET FOOD FOR THE FAMILY?
 LOCAL STORE HOME GARDEN/RAISED ANIMALS LOCAL MARKET OTHER (SPECIFY)
16. DO YOU HAVE A HOME GARDEN? YES NO
 IF YES, WHAT FOODS ARE GROWN?
17. WHAT KIND OF FOOD ASSISTANCE DO YOU RECEIVE?
 FOOD COUPONS MONEY FOR FOOD FREE FOOD GIFTS OTHER NONE
18. HOW DO YOU STORE OR KEEP YOUR FOOD?
 OPEN CUPBOARDS CLOSED CUPBOARDS REFRIGERATOR FREEZER OTHER
19. DO YOU PRESERVE ANY FOODS? YES NO
 IF YES, WHAT METHOD(S) ARE USED?
 FREEZER SMOKED DRIED CANNED OTHER (SPECIFY)
- 19.1 WHAT DO YOU DO WITH LEFT-OVER COOKED FOOD?
20. DO YOU RAISE ANIMALS FOR FOOD? YES NO IF YES, STATE TYPE:
21. WHO IN YOUR FAMILY SHOPS FOR FOOD?
 FATHER MOTHER CHILDREN OTHER (SPECIFY)
22. HOW MANY TIMES WAS FOOD PURCHASED THE PREVIOUS WEEK?
 EVERY DAY SEVERAL TIMES A WEEK ONCE A WEEK NONE
 WHAT TYPE OF TRANSPORT WAS USED TO OBTAIN FOOD SUPPLIES?
 WALKING BICYCLE BUS OTHER (SPECIFY)
23. WHAT FOODS WERE PURCHASED LAST WEEK?
 HOW MUCH MONEY WAS SPENT FOR THIS FOOD?
 WHEN WAS THE LAST TIME SOMEONE BOUGHT ALCOHOLIC BEVERAGES. LIST QUANTITY AND PRICE:
24. WHO PREPARES THE MEALS FOR YOUR FAMILY?
 FATHER MOTHER CHILDREN OTHER (SPECIFY)
25. WHO IN THE FAMILY DECIDES WHAT CHILDREN (UNDER 5 YEARS) WILL EAT?
 FATHER MOTHER GRANDMOTHER DOCTOR OLDER CHILDREN NOT APPLICABLE
 OTHER (SPECIFY)
26. BEFORE MOVING TO VILA DIOGO, WERE THERE ANY FOODS YOU ATE THAT YOU NOW DON'T EAT HERE?
 YES NO IF YES, NAME THE FOODS:
 WHY ARE YOU NOT EATING THESE FOODS NOW? NOT AVAILABLE MORE EXPENSIVE HERE
 OTHER (SPECIFY)

27. ARE THERE ANY FOODS YOU EAT NOW IN VILA DIOGO THAT YOU DID NOT EAT IN YOUR PREVIOUS PLACE OF RESIDENCE? YES NO IF YES, NAME THE FOODS:
WHY? WERE NOT AVAILABLE AT PREVIOUS HOME PRICE IS CHEAPER THAN BEFORE
OTHER (SPECIFY)
28. IF YOU WON THE LOTTERY, WHAT 3 THINGS WOULD YOU DO OR BUY?
29. IF YOU WERE GIVEN EXTRA MONEY TO SPEND ON FOOD, WHAT WOULD YOU BUY?
BUY MORE MEAT BUY MORE DIFFERENCE KINDS OF FOOD THAN YOU ALREADY EAT
BUY MORE SWEETS BUY MORE VEGETABLES, FRUITS OTHER (SPECIFY)
30. WHAT CHANGES OR IMPROVEMENTS WOULD YOU LIKE TO SEE IN THE:
HOME:
VILA DIOGO:
31. WHAT ARE SOME THINGS YOU LIKE ABOUT LIVING IN VILA DIOGO? WHY?
32. WHAT ARE SOME THINGS YOU DON'T LIKE ABOUT LIVING IN VILA DIOGO? WHY?

HEALTH -RELATED PRACTICES

33. WHAT ARE SOME THINGS YOU LIKE TO DO WHEN YOU ARE NOT WORKING?
WALKING CINEMA CYCLING VISIT THE PARK VISIT THE CIRCUS WATCH
TELEVISION LISTEN TO THE RADIO READ THE NEWSPAPER VISIT WITH
FRIENDS/FAMILY WATCH SOCCER MATCH GO TO THE BAR DANCING OTHER(SPECIFY)
34. SMOKING HABITS? (CIGARETTES)
- | | <u>FATHER</u> | <u>MOTHER</u> | <u>CHILDREN</u> |
|--|---------------|---------------|-----------------|
| | YES NO | YES NO | YES NO |
- LESS THAN 5
6 - 10
11 - 20
MORE THAN 20
DON'T KNOW

IF YOU DON'T SMOKE, WHY NOT?

APPENDIX C

DATE:

CODE NO:

NAME:

AGE:

24 - HOUR FOOD RECALL

PLEASE STATE THE KIND AND AMOUNT OF ALL FOODS AND BEVERAGES YOU ATE/
DRANK THE PAST 24 HOURS STARTING YESTERDAY MORNING WHEN YOU FIRST GOT UP.

	<u>FOODS</u>	<u>QUANTITY</u>
<u>TIME OF DAY</u>	(DESCRIPTION, PREPARATION METHOD)	HOUSEHOLD UNITS METRIC

AFTER GETTING UP
IN THE MORNING

MID MORNING

MID DAY

MID AFTERNOON

LATE AFTERNOON/

EARLY EVENING

NIGHT

FOOD FREQUENCY QUESTIONNAIRE

EVERY DAY SEVERAL TIMES SOMETIMES NEVER
 A WEEK

- COW'S MILK
SKIM MILK
CONDENSED MILK
POWDERED MILK
YOGURT
CHEESE
GOAT'S MILK

2. EGGS :

3. MEATS:

BEEF
PORK
MUTTON
GOAT
RABBIT
BRAZILIAN SAUSAGE
ITALIAN SAUSAGE
FRANKFURTERS
HAM
SALAMI
DRIED MEAT
CHICKEN
TURKEY
DUCK
SHELLFISH
FISH
LIVER
HEART
KIDNEY
BRAIN
GIZZARD
STOMACH

4. LEGUMES:

BEANS
SOYBEANS
DRIED PEAS
LENTILS

5. VEGETABLES:

POTATO
ONION
CAMBUQUIRA
CARROT
PUMPKIN
STRING BEANS
OKRA
EGG PLANT

SMALL EGGPLANT
GREEN ONION
CUCUMBER
TOMATO
LETTUCE
CAULIFLOWER
SAVOY CABBAGE
CABBAGE
WILD CHICORY
BROCCOLI
RUCULA
WATER CRESS
CHAYOTE
SWEET POTATO
MANIOC LEAVES
MANIOC

PEPPERS
PUMPKIN
SPINACH
RADISH
BEET LEAVES
BEET ROOT
YAMS
GREEN CORN

6. FRUITS:

ABIU
AVOCADO
AMORA
PINEAPPLE
PLUMS
BANANA
COOKING BANANA
CASHEW FRUIT
JAPANESE PERSIMMON
FIG
SWEETSOP
GABIROBA
GUAVA
CHERRY
JATоба
JABOTICABA
JAK FRUIT
ORANGE
LIME
APPLE
PASSION FRUIT
PAPAYA
MANGO
WATERMELON
MELON
STRAWBERRY
NECTARINE
PEAR
PEACH
TANGERINE
BRAZILIAN TANGERINE
TAMARIND
GRAPES
GRAPEFRUIT
LIMAO
CARAMBOLA
MAROLO

7. CEREALS:

RICE
MAIZE
WHEAT FLOUR
OATS
WHOLE WHEAT BREAD
WHITE BREAD
RYE BREAD
MACARONI
BUNS (ROLLS)
BREAKFAST CEREALS
FUBA
CORNSTARCH, ARROWROOT

8. FATS AND OILS:

PORK FAT
BEEF FAT
COCOA BUTTER
COCONUT OIL
BUTTER
MARGARINE
COTTONSEED OIL
PEANUT OIL
CORN OIL
SOYBEAN OIL

9. DESSERTS, SWEETS, AND SUGAR:

SUGAR (NOT REFINED)
REFINED SUGAR
RICE PUDDING
CAKES AND COOKIES
SWEETS AND CHOCOLATES
FRUIT PASTES
MILK PUDDING
GELATIN
JAMS
HONEY
RAPADURA
ICE CREAM

10. BEVERAGES:

COFFEE WITH SUGAR
COFFEE WITHOUT SUGAR
COFFEE WITH SUGAR AND MILK
COFFEE WITHOUT SUGAR/MILK
BEER
TEA WITH SUGAR
TEA WITHOUT SUGAR
TEA WITH SUGAR/MILK
TEA WITHOUT SUGAR/MILK

HERB TEA
MATE
CHOCOLATE
DOURADINHA
GIN, WHISKEY, RUM
GUARANA
PINGA
Q-SUCO
CARBONATED BEVERAGES
SUGAR CANE JUICE
FRESH FRUIT JUICE
FRUIT JUICE/MILK

11. NUTS AND SEEDS:

PEANUTS
CASHEW NUTS
COCONUT
CHESTNUTS
ALMONDS
JAK FRUIT NUTS
PUMPKIN SEEDS
SUNFLOWER SEEDS

12. CONDIMENTS, SAUCES, AND SALT:

GINGER
MINT
CHIVES
GARLIC
SALT
RED PEPPER
BLACK PEPPER
LAUREL
PARSLEY
TOMATO SAUCE
VINEGAR SAUCE
MAYONNAISE
PEPPER SAUCE

APPENDIX E

DATE:
NAME:
CODE NO:
AGE:

FOOD PREFERENCES QUESTIONNAIRE

THIS QUESTIONNAIRE IS TO BE ADDRESSED TO THE MIGRANT WOMAN IN ORDER TO OBTAIN INFORMATION REGARDING THE FOOD SHE LIKES, DISLIKES, OR FOODS THAT HAVE NEVER BEEN TRIED.

- | | <u>LIKES</u> | <u>DISLIKES</u> | <u>NEVER TRIED OR</u>
<u>UNFAMILIAR</u> |
|-----------------------------------|--------------|-----------------|--|
| 1. <u>MILK AND MILK PRODUCTS:</u> | | | |
| COW'S MILK | | | |
| SKIM MILK | | | |
| CONDENSED MILK | | | |
| POWDERED MILK | | | |
| YOGURT | | | |
| CHEESE | | | |
| GOAT'S MILK | | | |
| 2. <u>EGGS:</u> | | | |
| 3. <u>MEATS:</u> | | | |
| BEEF | | | |
| PORK | | | |
| MUTTON | | | |
| GOAT | | | |
| RABBIT | | | |
| BRAZILIAN SAUSAGE | | | |
| ITALIAN SAUSAGE | | | |
| FRANKFURTERS | | | |
| HAM | | | |
| SALAMI | | | |
| DRIED MEAT | | | |
| CHICKEN | | | |
| TURKEY | | | |
| DUCK | | | |
| SHELLFISH | | | |
| FISH | | | |
| LIVER | | | |
| HEART | | | |
| KIDNEY | | | |
| BRAIN | | | |
| GIZZARD | | | |
| STOMACH | | | |
| 4. <u>LEGUMES:</u> | | | |
| BEANS | | | |
| SOYBEANS | | | |
| DRIED PEAS | | | |
| LENTILS | | | |
| 5. <u>VEGETABLES:</u> | | | |
| POTATO | | | |
| ONION | | | |
| CAMBUQUIRA | | | |
| CARROT | | | |
| PUMPKIN | | | |
| STRING BEANS | | | |
| OKRA | | | |
| EGG PLANT | | | |
| SMALL EGGPLANT | | | |
| GREEN ONION | | | |
| CUCUMBER | | | |
| TOMATO | | | |
| LETTUCE | | | |
| CAULIFLOWER | | | |
| SAVOY CABBAGE | | | |
| CABBAGE | | | |
| WILD CHICORY | | | |
| BROCCOLI | | | |
| RUCULA | | | |
| WATER CRESS | | | |
| CHAYOTE | | | |
| SWEET POTATO | | | |
| MANIOC LEAVES | | | |
| MANIOC | | | |
| PEPPERS | | | |
| PUMPKIN | | | |
| SPINACH | | | |
| RADISH | | | |
| BEET LEAVES | | | |
| BEET ROOT | | | |
| YAMS | | | |
| GREEN CORN | | | |
| 6. <u>FRUITS:</u> | | | |
| ABIU | | | |
| AVOCADO | | | |
| AMORA | | | |

PINEAPPLE
PLUMS
BANANA
COOKING BANANA
CASHEW FRUIT
JAPANESE PERSIMMON
FIG
SWEETSOP
GABIROBA
GUAVA
CHERRY
JATIBA
JABOTICABA
JAK FRUIT
ORANGE
LIME
APPLE
PASSION FRUIT
PAPAYA
MANGO
WATERMELON
MELON
STRAWBERRY
NECTARINE
PEAR
PEACH
TANGERINE
BRAZILIAN TANGERINE
TAMARIND
GRAPES
GRAPEFRUIT
LIMAO
CARAMBOLA
MAROLO

7. CEREALS:

RICE
MAIZE
WHEAT FLOUR
OATS
WHOLE WHEAT BREAD
WHITE BREAD
RYE BREAD
MACARONI
BUNS (ROLLS)
BREAKFAST CEREALS
FUBA
CORNSTARCH, ARROWROOT

8. FATS AND OILS:

PORK FAT
BEEF FAT
COCOA BUTTER
COCONUT OIL
BUTTER
MARGARINE
COTTONSEED OIL
PEANUT OIL
CORN OIL
SOYBEAN OIL

9. DESSERTS, SWEETS, AND SUGAR:

SUGAR (NOT REFINED)
REFINED SUGAR
RICE PUDDING
CAKES AND COOKIES
SWEETS AND CHOCOLATES
FRUIT PASTES
MILK PUDDING
GELATIN
JAMS
HONEY
RAPADURA
ICE CREAM

10. BEVERAGES:

COFFEE WITH SUGAR
COFFEE WITHOUT SUGAR
COFFEE WITH SUGAR/MILK
COFFEE WITHOUT SUGAR/MILK
BEER
TEA WITH SUGAR
TEA WITHOUT SUGAR
TEA WITH SUGAR/MILK
TEA WITHOUT SUGAR/MILK
HERB TEA
MATE
CHOCOLATE
DOURADINHA

GIN, WHISKEY, RUM
GUARANA
PINGA
Q-SUCO
CARBONATED BEVERAGES
SUGAR CANE JUICE
FRESH FRUIT JUICE

FRUIT JUICE/MILK

11. NUTS AND SEEDS:

PEANUTS
CASHEW NUTS
COCONUT
CHESTNUTS
ALMONDS
JAK FRUIT NUTS
PUMPKIN SEEDS
SUNFLOWER SEEDS

12. CONDIMENTS, SAUCES, AND SALT:

GINGER
MINT
CHIVES
GARLIC
SALT
RED PEPPER
BLACK PEPPER
LAUREL
PARSLEY
TOMATO SAUCE
VINEGAR SAUCE
MAYONNAISE
PEPPER SAUCE

APPENDIX F

CODE NO:

NAME :

AGE: SEX:

INFANT FEEDING PRACTICES QUESTIONNAIRE

THE PURPOSE OF THE QUESTIONNAIRE IS TO OBTAIN INFORMATION OF FEEDING PRACTICES FOR INFANTS CURRENTLY TWO YEARS OF AGE AND YOUNGER. IN THE FOLLOWING TABLE, IDENTIFY THE AGE AT WHICH THE VARIOUS FOODS WERE FIRST INTRODUCED.

[illegible]

1. IF BOTTLE FEEDING WAS STARTED AT BIRTH, STATE THE REASON WHY:

- ☐ MOTHER WAS SICK
- ☐ MOTHER DIDN'T WANT TO BREAST FEED
- ☐ MOTHER DIDN'T HAVE ENOUGH BREAST MILK
- ☐ MOTHER WAS GOING TO WORK
- ☐ OTHER REASON (SPECIFY) _____

2. WHAT KIND OF BREAST MILK SUBSTITUTES DID YOU USE?

- ☐ FRESH COW'S MILK
- ☐ FRESH GOAT'S MILK
- ☐ POWDERED WHOLE MILK
- ☐ POWDERED SKIM MILK
- ☐ CONDENSED MILK (SWEETENED)
- ☐ SOY MILK
- ☐ POWDERED BABY MILK FORMULA
- ☐ OTHER (SPECIFY) _____

3. IF INFANTS ARE BREAST FED, HOW ARE INFANTS WEANED?

- ☐ SUDDENLY
- ☐ GRADUALLY
- ☐ BY RUBBING BAD TASTING SUBSTANCES ON THE BREAST
- ☐ OTHER METHOD(S) (SPECIFY) _____

4. HOW DO YOU FEED INFANTS WHEN THEY HAVE FEVER?

- ☐ THE SAME AS WHEN THEY ARE WELL
- ☐ DON'T GIVE THEM ANYTHING TO EAT OR DRINK
- ☐ GIVE INFANTS ONLY DRINKS
- ☐ OTHER (SPECIFY) _____

5. HOW DO YOU FEED INFANTS WHEN THEY HAVE DIARRHEA?

- ☐ THE SAME AS WHEN THEY ARE WELL
- ☐ DON'T GIVE THEM ANYTHING TO EAT OR DRINK
- ☐ GIVE INFANTS ONLY DRINKS
- ☐ GIVE INFANTS PURGES
- ☐ OTHER (SPECIFY) _____

6. HOW DO YOU FEED INFANTS WHEN THEY HAVE OTHER SICKNESSES?

- ☐ THE SAME AS WHEN THEY ARE WELL
- ☐ DON'T GIVE THEM ANYTHING TO EAT OR DRINK
- ☐ GIVE INFANTS ONLY DRINKS
- ☐ GIVE INFANTS PURGES
- ☐ OTHER (SPECIFY) _____

APPENDIX G

DATE:

NAME:

CODE NO:

AGE:

NUTRITION KNOWLEDGE QUESTIONNAIRE

1. WHY IS IT NECESSARY THAT PEOPLE EAT EVERY DAY?
 - 1) TO STOP THE FEELING OF BEING HUNGRY
 - 2) TO GROW
 - 3) TO KEEP THE BODY HEALTHY
 - 4) TO HAVE ENRGY -TO FEEL STRONG
 - 5) OTHER (SPECIFY)
 - 6) DON'T KNOW
2. IS IT NECESSARY THAT PEOPLE EAT DIFFERENT KINDS OF FOOD?
 - 1) YES 2) NO 3) DON'T KNOW

IF YES, WHY?

 - 1) DON'T KNOW
 - 2) NO ONE FOOD CONTAINS EVERYTHING YOU NEED TO GROW STRONG AND HEALTHY
 - 3) OTHER (SPECIFY)
3. WHEN WOMEN ARE PREGNANT OR LACTATING, THEY SHOULD:
 - 1) EAT LESS FOOD THAN BEFORE
 - 2) EAT THE SAME AMOUNT OF FOOD AS BEFORE
 - 3) EAT MORE FOOD THAN BEFORE
 - 4) DON'T KNOW
4. WHAT FOOD(S) OR DRINK(S) ARE GOOD FOR:

NEWBORNS:

 - 1) BREASTMILK/MILK
 - 2) OTHER (SPECIFY)

BABIES:

 - 1) BREASTMILK/MILK
 - 2) CEREALS
 - 3) VEGETABLES
 - 4) FRUIT
 - 5) MEAT/FISH
 - 6) EGGS, CHEESE
 - 7) NUTS/SEEDS
 - 8) OTHER (SPECIFY)

TODDLERS:

 - 1) BREASTMILK/MILK
 - 2) CEREAL
 - 3) VEGETABLES
 - 4) FRUIT
 - 5) MEAT/FISH
 - 6) EGGS, CHEESE
 - 7) NUTS/SEEDS
 - 8) OTHER (SPECIFY)

REASON:

 - 1) MAKES CHILDREN GROW HEALTHY AND STRONG
 - 2) DON'T KNOW
 - 3) OTHER (SPECIFY)
5. WHAT FOOD(S) OR DRINK(S) ARE NOT GOOD FOR:

NEWBORNS:

 - 1) CARBONATED BEVERAGES
 - 2) COFFEE
 - 3) TEA/HERB TEA
 - 4) SUGAR WATER
 - 5) UNDILUTED COW'S MILK
 - 6) STARCHY GRUELS
 - 7) OTHER (SPECIFY)

BABIES:

 - 1) COFFEE
 - 2) TEA/HERB TEA
 - 3) CARBONATED BEVERAGES
 - 4) UNDILUTED COW'S MILK
 - 5) STARCHY GRUELS ONLY
 - 6) CANDY, OTHER SWEETS
 - 7) OTHER (SPECIFY)

TODDLERS:

 - 1) COFFEE
 - 2) TEA/HERB TEA
 - 3) SWEETS (EG. CANDY, ETC.)
 - 4) CARBONATED BEVERAGES
 - 5) OTHER (SPECIFY)

REASON:

 - 1) TEETH MAY NOT BE GOOD AND STRONG
 - 2) CHILD MAY NOT GROW HEALTHY AND STRONG
 - 3) DON'T KNOW
 - 4) OTHER (SPECIFY)

APPENDIX H

DATE:

NAME:

CODE NO:

AGE:

NUTRITION ATTITUDES/BELIEFS QUESTIONNAIRE

1. WHY DO YOU THINK PEOPLE GET SICK?

2. WHAT FOOD OR DRINKS DO YOU CONSIDER TO BE USED MOST OFTEN IN YOUR HOUSE?
WHY?

3. WHAT FOOD(S) OR DRINK(S) DO YOU CONSIDER TO BE VERY SPECIAL AND WHICH YOU
EAT ONLY ON SPECIAL DAYS OR DIFFERENT TIMES OF THE YEAR?

NAME: WHEN EATEN: REASON FOR EATING:

4. ARE THERE ANY FOODS YOU BELIEVE CAUSE INFERTILITY IN WOMEN?

---- YES

---- NO

IF YES, NAME:

5. DO YOU BELIEVE THERE ARE FOODS WOMEN SHOULD NOT EAT OR DRINK WHEN THEY ARE:

MENSTRUATING: --- YES

NAME:

REASON:

--- NO

PREGNANT: --- YES

--- NO

IMMEDIATELY AFTER CHILDBIRTH: --- YES

--- NO

BREAST FEEDING:

--- YES

--- NO

6. ARE THERE ANY SPECIAL FOOD(S) OR DRINK(S) YOU BELIEVE WOMEN SHOULD EAT WHEN
THEY ARE:

MENSTRUATING: --- YES

NAME:

REASON:

--- NO

PREGNANT: --- YES

--- NO

IMMEDIATELY AFTER CHILDBIRTH: --- YES

--- NO

BREAST FEEDING:

--- YES

--- NO

APPENDIX I

Nutrition Education Materials

LESSON 1 - PROJECT NUPORANGA

Importance of Foods for Better Health

Objectives

1. To be able to identify various foods (qualitative aspects) and group them into three groups according to their nutritional importance (energy foods, building foods, protective foods, and also non-foods).
2. To be able to say why different foods are necessary for our body (functions of foods) and in what combination (balancing of foods).
3. To be able to recognize quantitative differences in the amounts of food needed for sedentary versus working individuals and for growing, pregnant and lactating individuals.

Contents

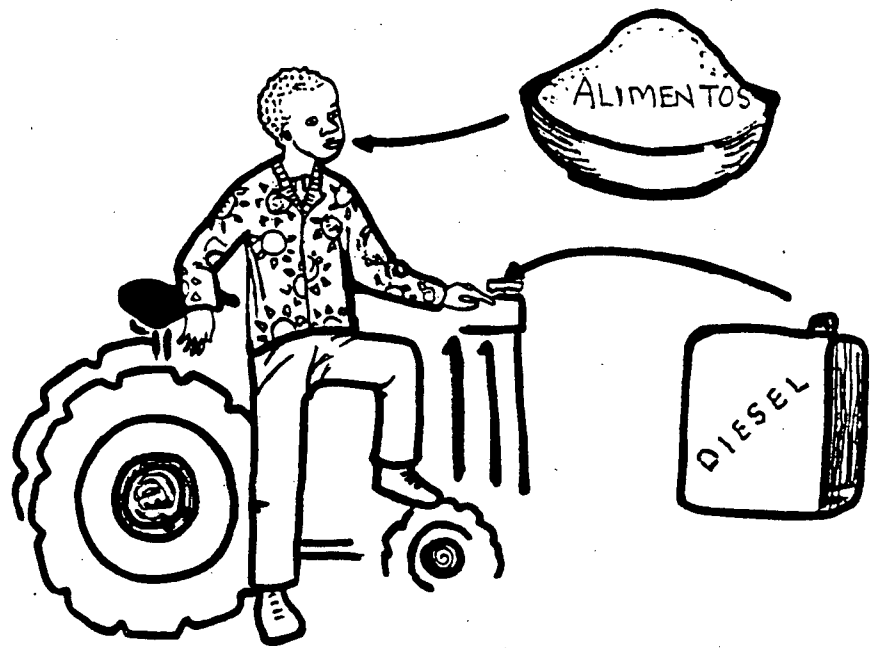
1. Illustrations with names of foods and groups in Portuguese, as appended.
2. Present each of the above illustrations, explain and discuss. Bring along some real food items with which they may be most familiar.
3. Allow opportunities for the subjects to participate in discussion and ask questions.

Summary and reinforcement of major principles

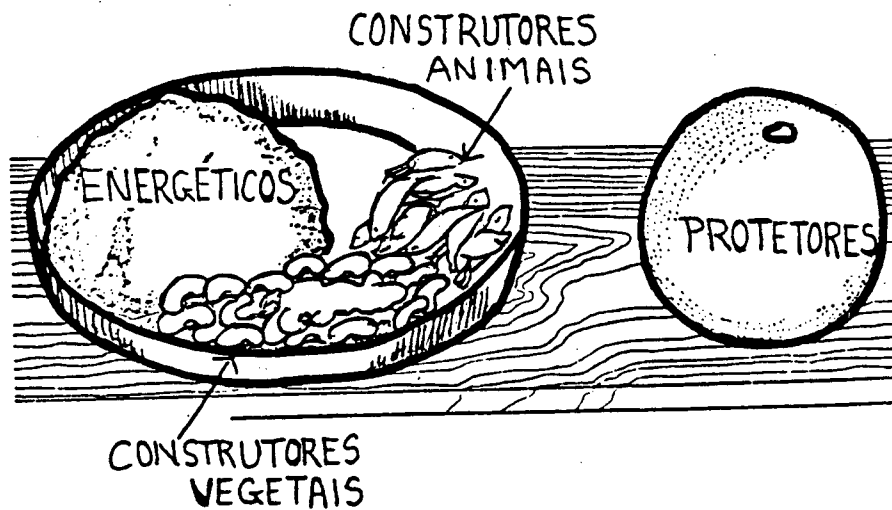
1. Summarize very quickly the high-lights of this lesson to reinforce basic concepts.

Questions

1. Present names of various local and familiar foods and let them classify these into three groups and also be able to recognize non-foods.
2. Ask them what foods would they balance the foods in question.
3. Ask about who needs more food in a family?



FUNÇÕES DOS ALIMENTOS

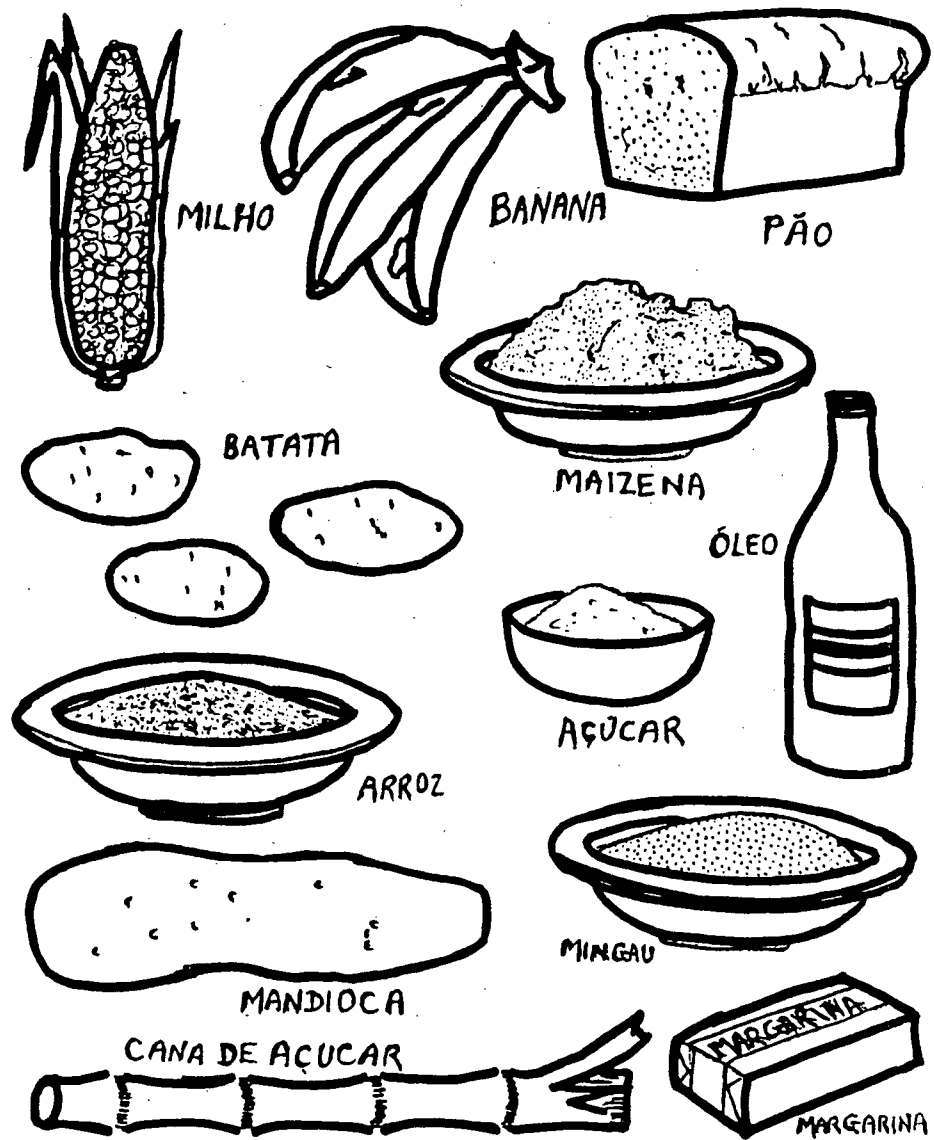


BALANCEAMENTO DOS ALIMENTOS

Figure 1

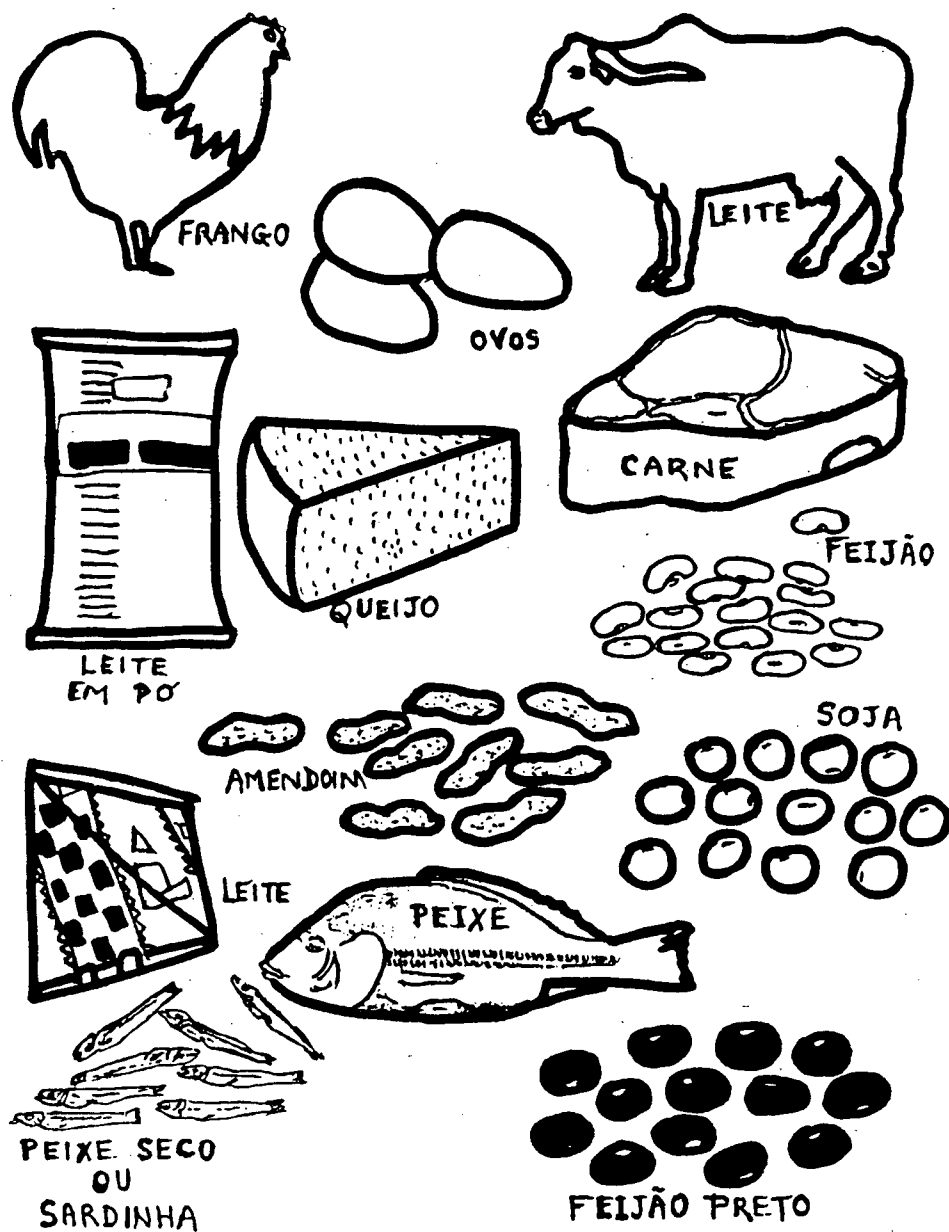


Figure 2



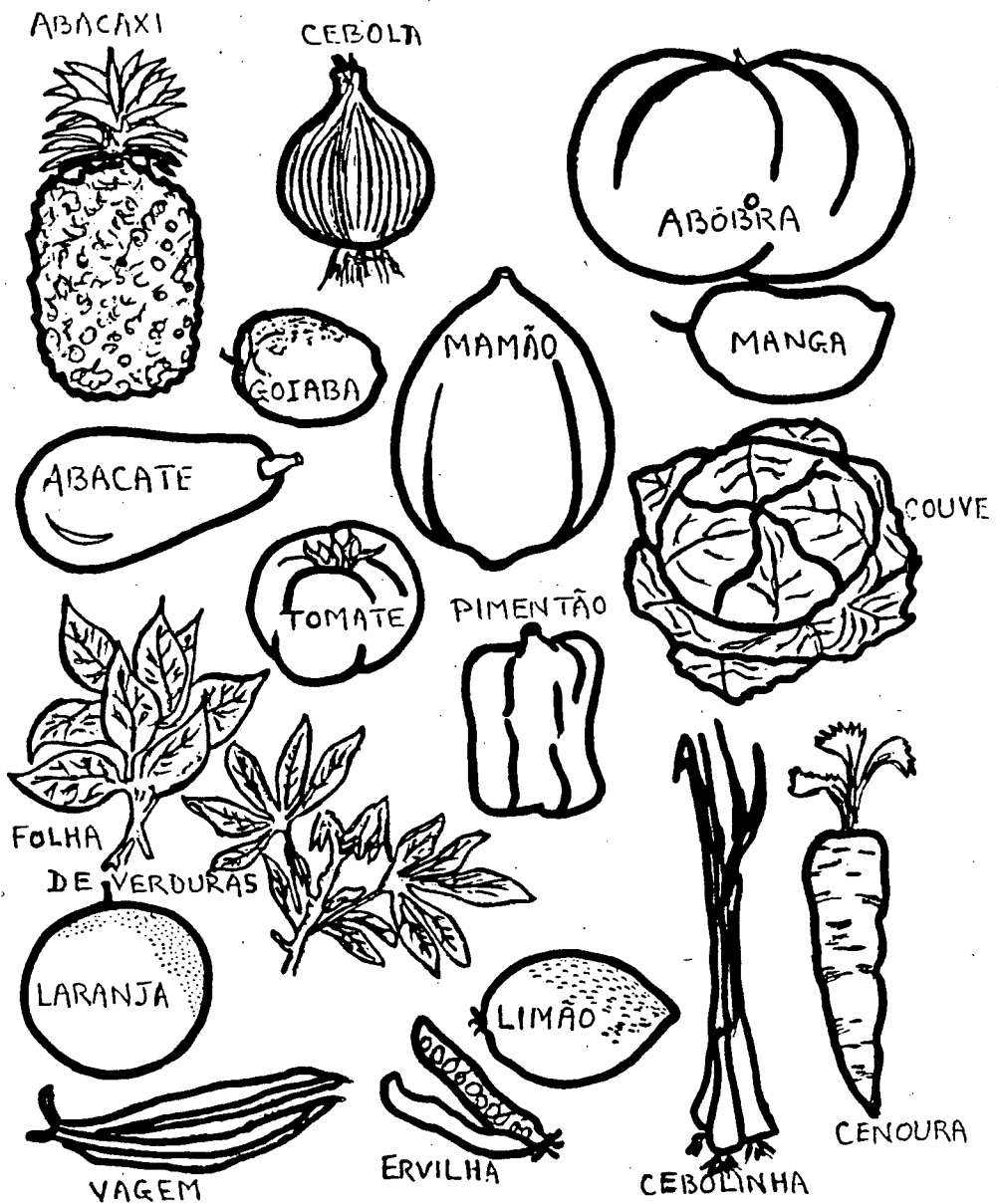
ALIMENTOS ENERGÉTICOS

Figure 3



ALIMENTOS CONSTRUTORES

Figure 4



ALIMENTOS PROTETORES

Figure 5



ALIMENTOS NÃO-NUTRITIVOS

Figure 6

LESSON 2

Measuring and Monitoring Growth and Nutrition of Children

Educational Objectives

1. To be able to explain the relationship between growth, development and nutrition.
2. To be able to use growth (weight and height) as an index of health and to be able to detect healthy versus malnourished children by maintaining growth chart for each child.
3. To be able to use simple arm circumference measurement as a "child nutrition indicator" (healthy versus malnourished child).

Content with Illustrations and Activities

1. What is the relationship between nutrition, growth and development?

Food is needed for growth, physical activities, good health, and the maintenance of life.

Growth is the gradual increase in size of the body and its organs.

Development is the increase in the number of skills performed by the body, including the brain, and in the use of those skills, e.g. learning to walk, talk, play, think, etc.

Growth and Development are fundamental features of children. If the child is growing well he is probably healthy and adequately nourished. If the child is not growing well, there must be some reason for this. He may be receiving inadequate nourishment (inadequate amount and/or poor quality food). He may also be sick, e.g. diarrhea. Sickness comes from dirty food, unclean water, dirty hands, utensils, clothes, toys, etc. and from unsanitary conditions within and outside the house. "Clean habits promote good health". Months before a child has obvious signs of malnutrition he will have stopped growing. Growth failure is the early sign of malnutrition.

Measuring a child's growth is one way of measuring his health and the quality of his nutrition.

Figures

1. The under-weight child.
2. Kwashiorkor and marasmus (excessive underweight): two common diseases of growth failure in children.
3. Healthy children grow into clever adults.
4. A weight-for-age graph showing growth.
5. The older a child is, the more he should weigh.

Growth is measured in different ways.

Body weight is the simplest measurement. In children, change in weight is the most reliable indicator of growth. When a baby is born he weighs about 3 kg. If he grows well, he will weight about 6 kg by 5 months of age and about 9 kg by 1 year of age. This means that healthy babies double their birth weight in 5 months and treble their birth weight by 12 months. After that, the increase in weight is not so fast, only about 2 kg per year.

Height (or length in the case of infants) is another measure of growth. At birth a baby is about 50 cm long. By 1 year of age he should be about 72 cm long. Height is a particularly useful indicator of growth among older children. If a child is quite long or tall, but his weight is low, he is thin and wasted. A malnourished child may also be short or stunted.

Head of a baby grows very quickly, especially in the first year of life. This is because the brain is growing very rapidly. Mental development and learning abilities of a child depend on the brain. The growth and development of the brain also requires adequate nutrition especially in early life. Head circumference can be measured to assess growth and development of the head up to 3 years of age from birth.

2. How to use growth charts (weight and height) to monitor health and nutritional status of children in the family.

Normal growth and development in children are signs of good health and nutrition. One of the best ways to measure a child's health is to measure growth. One of the easiest ways of measuring growth is to weigh a child regularly (preferably every month) and to compare the weight with the standard weight for age. Height should also be measured regularly, if possible, and compared with a standard height for age. Take children regularly to health centre or a hospital to measure weight and height and keep a record of it on growth charts. Explain the growth chart and its importance, especially during first 5 years from birth.

Demonstrations and activities

1. Show "Marcondes Growth Charts" for boys and girls up to 36 months and boys and girls up to 12 years of age.
2. Point out normal growth line and upper and lower limits of growth.
3. Demonstrate how to read weights and heights on the growth charts.
4. Explain sets of "Marcondes Growth Charts" to mothers and show them record of weights and heights of their own children.
5. Help them interpret the data of their own children.

How to interpret the growth line

1. Increase in weight with age is more important than weight on any one occasion.
2. Direction of growth line, upwards, horizontally, or downwards is very important. Remember that when the line is going up, the child is growing; this is good. If the line is horizontal or going down, the child is not growing well, and this is not good. (Use illustrations to clarify).
3. In the first 6 months of life, a levelling off or a downward movement of the growth line is a serious matter. After 2 years a small variation over 1 or 2 months is not so serious.

4. Any child who does not gain weight for 3 months should be referred to a doctor in local health centre or a hospital.
3. How to use a simple arm circumference measurement as a "child nutrition indicator" to detect whether the child is "well-nourished" or "malnourished".

When babies are about 1 year old, they have quite a lot of fat under the skin of their arms. When they are 5 years old, there is much less fat and more muscle. But, as shown in Figure 6, the distance around the upper arm (the circumference) remains almost the same (16 to 17 cm) between the ages of 1 and 5 years. If the child is malnourished, this circumference is reduced. An arm circumference of less than 14 cm shows malnutrition in a 1 to 5 year old child. Usually "well-nourished" children have arm circumference above 14 cm, while "malnourished" children have arm circumference below 14 cm from 1 to 5 years of age.

Measuring the mid-upper-arm circumference

Making a measuring strip or string

1. Clear celluloid strip can be made from old x-ray film from the nearest hospital or clinic. Soak the film overnight in a strong solution of washing soda, wash in water and wipe it clear with a cloth.
2. Cut a strip about 20 cm long and 2 cm wide. Nylon string (fishing string or old string from tennis racket) can also be used.
3. Using a sharp needle, make two scratches on the strip at 12.5 cm and 14 cm respectively from one end of the strip or string.
4. Color the strip red from the end to the 12.5 cm mark with a spirit felt pen.
5. Color the strip yellow from the 12.5 cm mark to the 14 cm mark with a similar felt pen.
6. Color the strip green from the 14 cm mark to the other end.

Using the strip or string

1. Measuring strip or string should be used only on children who are more than 1 year old.
2. Put the strip or string around the mid upper arm of the child and see which color is touched by the red end of the strip or string.
 - 1) If the red end touches the green part of the strip or string, the child is "well-nourished".
 - 2) If the red end touches the yellow part, the child is "probably malnourished".
 - 3) If the red end touches the red part, the child is "malnourished".
3. This is a quick and easy way of determining malnutrition in children 1 to 5 years of age.

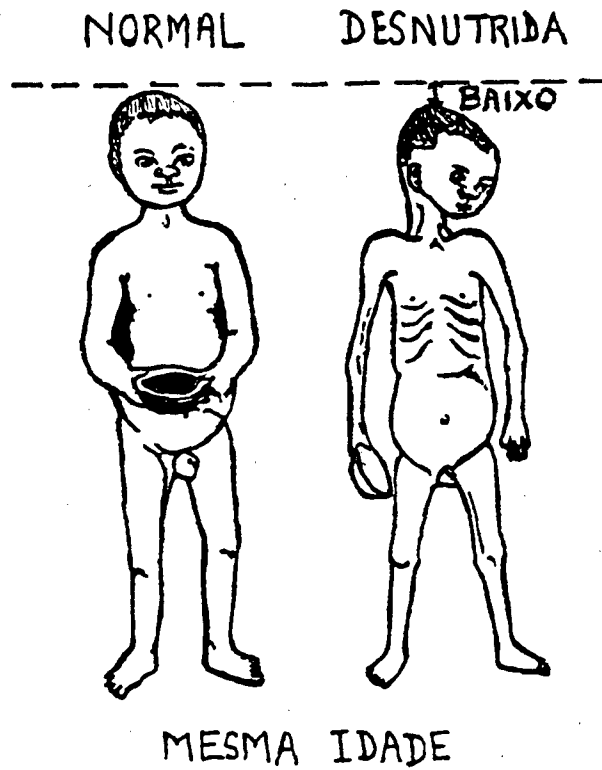
Summary of Major Points

Summarize very quickly the major points to reinforce the basic concepts of this lesson.

Questions

1. Q. What is the relationship between growth and nutrition?
A. Good growth is a sign of good nutrition and better health.
Q. What are two factors most important for growth?
A. Good diet (adequate amount & quality) and good hygienic practices to prevent infection.
2. Q. What are two good indicators of growth?
A. Weight and height.
Q. What should be the weight of a baby when born?
A. About 3 kg.
Q. What should be done if a child has not gained weight for 3 months?
A. Take to a doctor at a nearby health centre or a hospital with appropriate documents.

3. Q. What other simple indicator can be used at home to detect whether the child is well-nourished or malnourished?
- A. Mid-upper-arm circumference.
- Q. What should be the arm circumference of a well-nourished child from 1 to 5 years of age?
- A. 14 to 16 cm.
- Q. What would you do if your 3 year old child has arm circumference of less than 12.5 cm?
- A. Consult a doctor, give extra amount of good quality food, improve sanitary conditions and hygienic practices.



A CRIANÇA ESTÁ ABAIXO
DO PESO E NÃO TEM ALTURA NORMAL

Figure 1

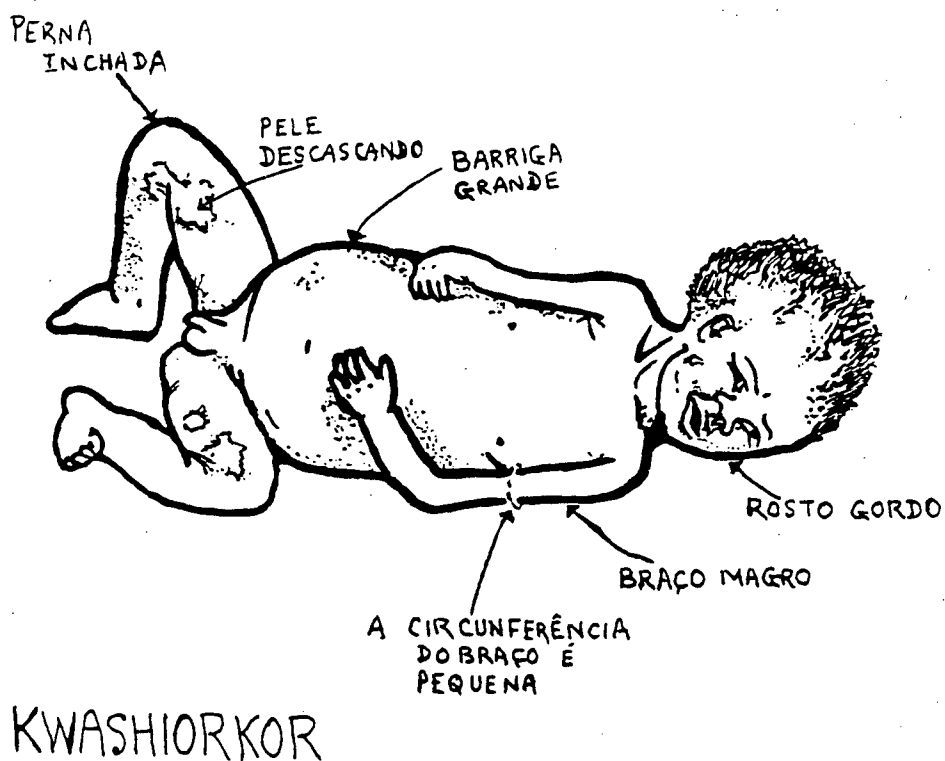
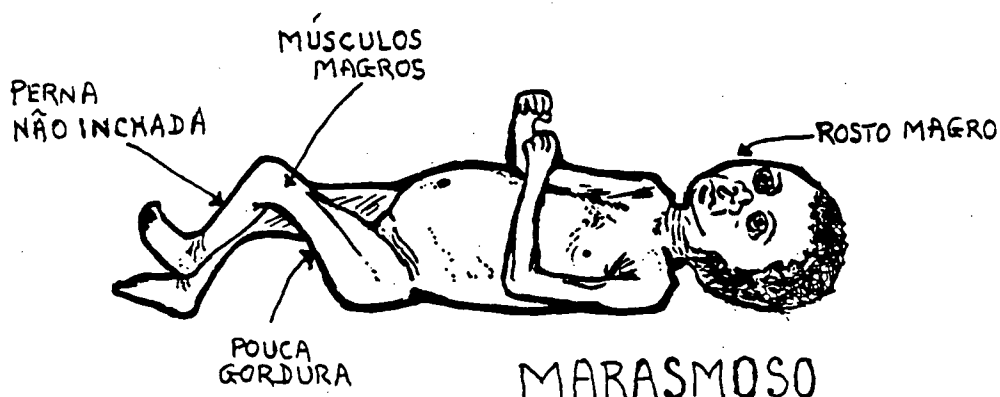
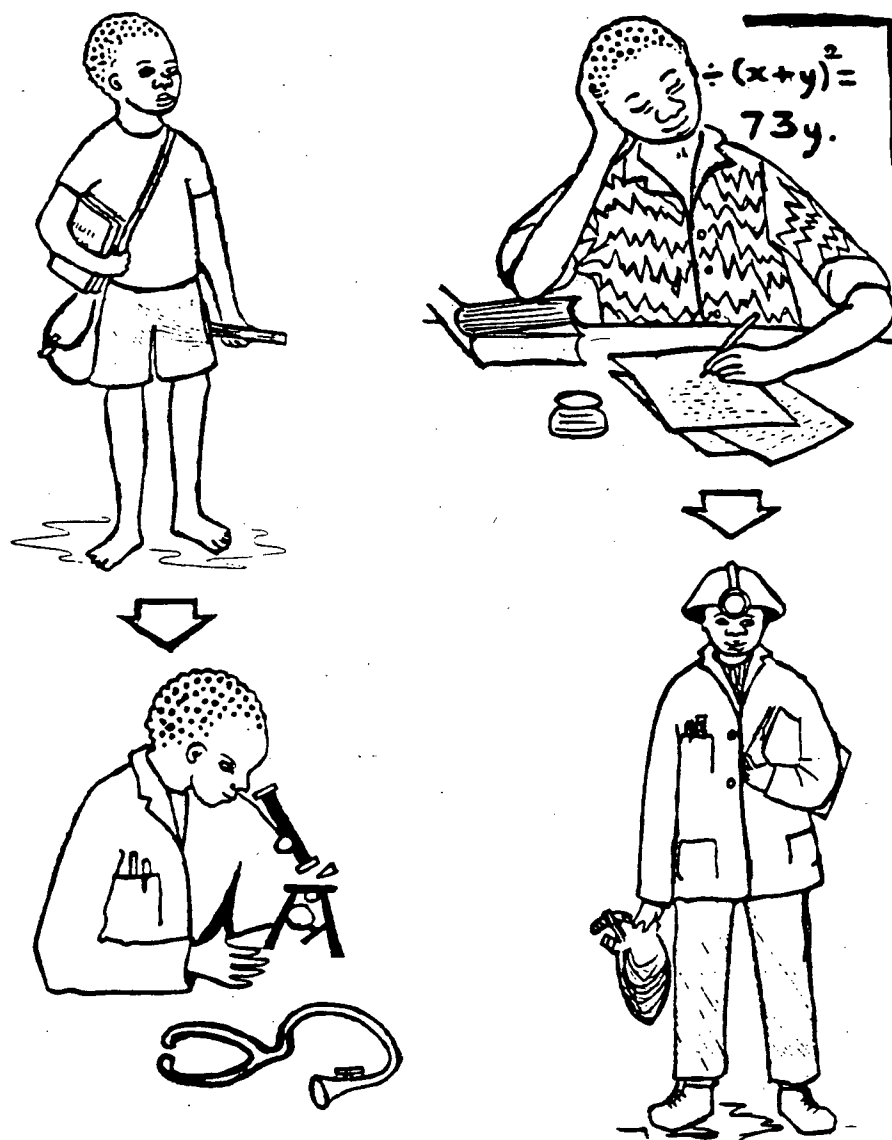


Figure 2



CRIANÇAS SAUDÁVEIS
TORNAM-SE ADULTOS ESPERTOS

Figure 3

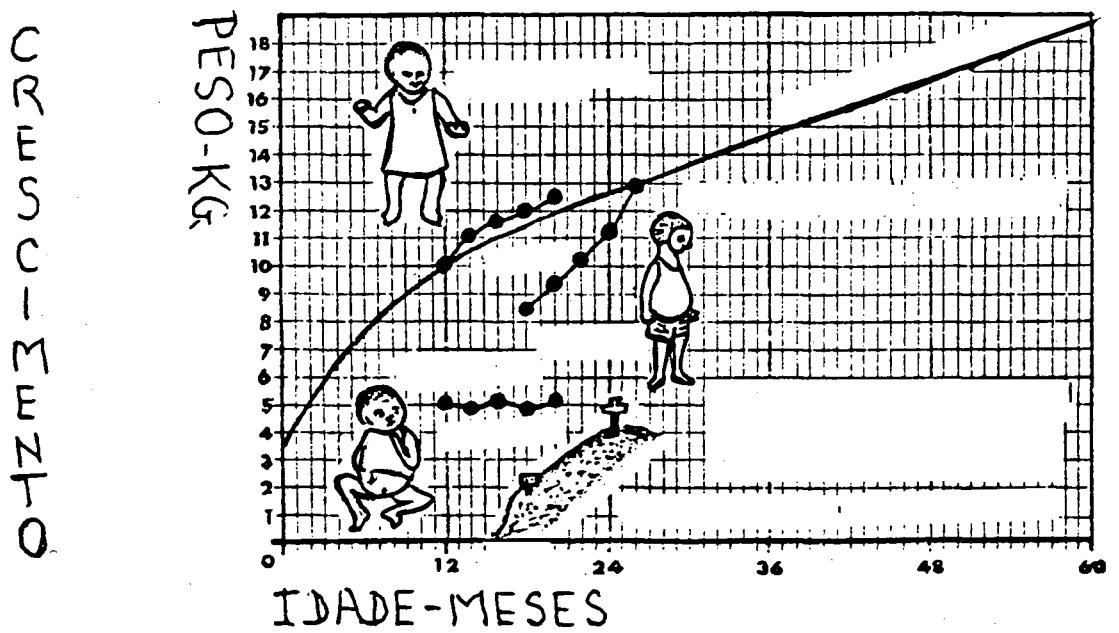
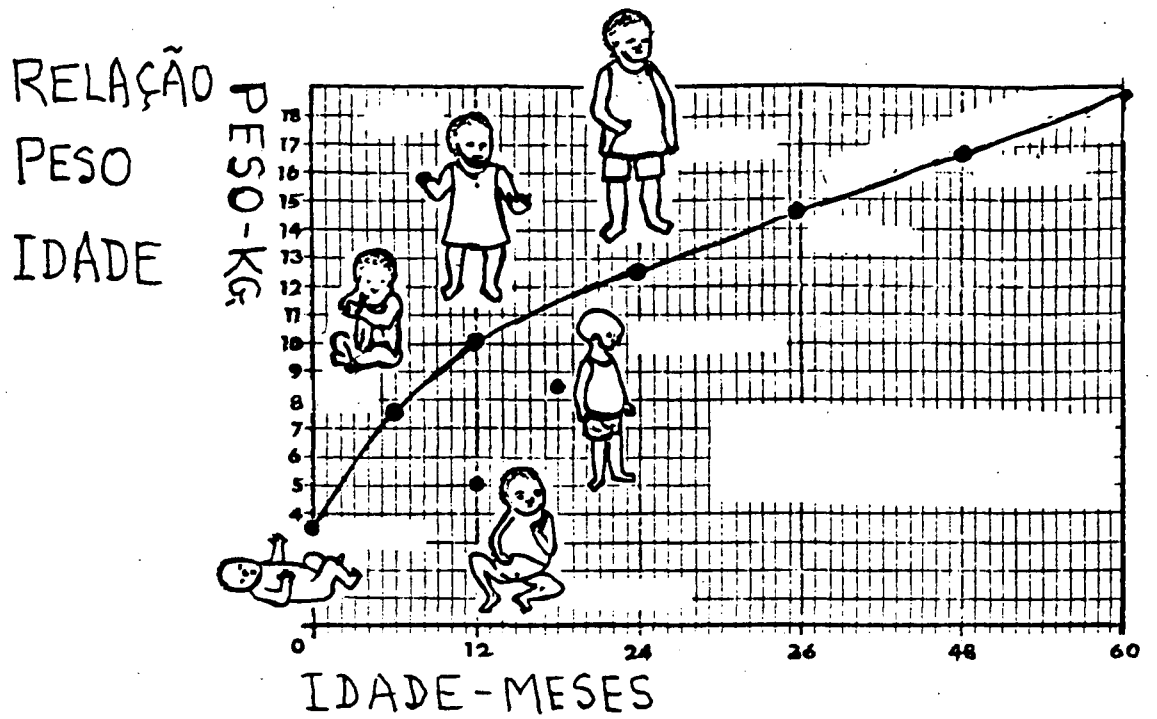


Figure 4

CRESCIMENTO



RELAÇÃO PESO-IDADE

Figure 5



ADULTO

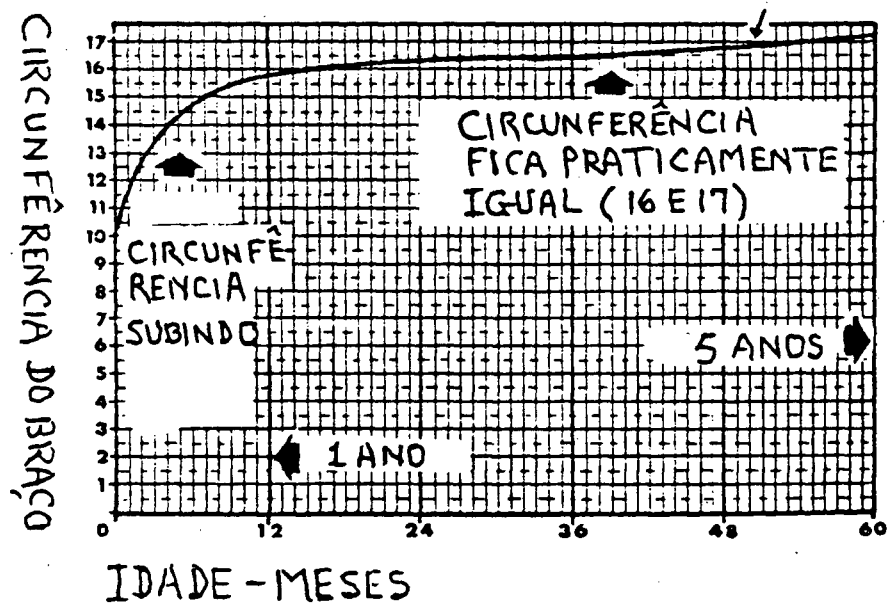
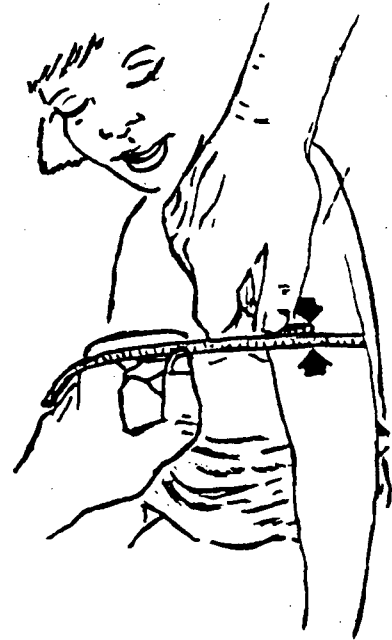
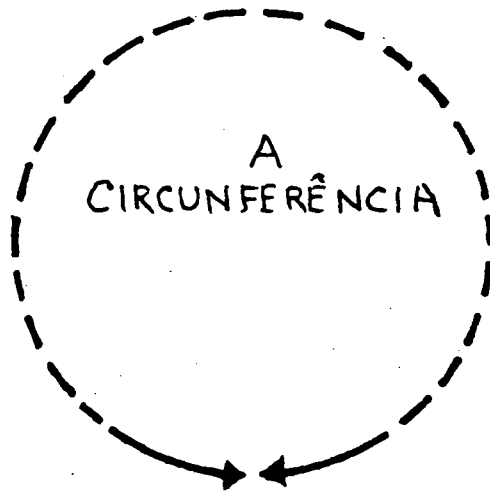
HOMEM 65 KG

MULHER 55 KG

O PESO DA CRIANÇA

PRECISA AUMENTAR COM A IDADE

Figure 6



MEDIDA DA CIRCUNFERÊNCIA DO BRAÇO SUPERIOR

LESSON 3

Breast Feeding

Educational Objectives

1. Encourage women to breast feed their infants and teach them the advantages of breast feeding.
2. Show women how to breast feed, explaining the practical points.
3. Explain to mothers the risk and cost of bottle feeding.
4. Teach mothers how to feed a baby if the mother has no milk.

Content with Illustrations and Activities

Introduction

Breast feeding is the most natural and perfect way of raising a healthy baby. Anything other than breast feeding is artificial feeding. The most common type of artificial feeding is bottle feeding which can be bad and dangerous. Breast milk is good and healthy, besides being safe and economical. In this lesson we will learn about breast feeding and its advantages and about bottle feeding and its disadvantages. (Figure 1).

1. Advantages of Breast Feeding

There are many advantages of breast feeding and all mothers whether rich or poor should choose to breast feed their babies as long as they can.

1) Breast milk is the best natural food for babies

Breast milk is the perfect food for babies. It has right amounts and proportions of energy giving carbohydrates and fats, constructive proteins and protective nutrients vitamins and minerals, needed for growth and good health of the baby. It is easy to digest and protects the child from infection. Cow's milk is natural food for calves and not ideally suited for a human baby.

Breast milk is suited to the growth needs of babies. Up to 4 months of age no other food is needed. Starting from 4-6 months, other food should also be given, but breast feeding should continue. Breast feeding is still important for growth in the second year of life.

2) Breast milk is always clean

Mother's milk passes straight from the breast into the infant's mouth. In that way it cannot be infected by germs. Many germs grow well in milk. Other milks are easily contaminated by dirty hands, spoons, cups, bottles or flies. These milks should be boiled before being given to babies.

3) Breast milk protects the baby from diseases

Breast milk contains protective substances against the germs that cause diarrhea and some coughs and colds. The milk that comes from mother's breast for the first few days is thin and watery and is called colostrum. It is ideal for baby, especially because it contains higher amount of protective substances for a new baby. Breast feed your baby as long as you can, as breast fed babies have fewer infections and are healthier.

4) Breast milk is available 24 hours a day and requires no special preparation

With breast milk there is a special mechanism of demand and supply. The more often a baby sucks, the more milk the mother will produce. Other types of milk need to be boiled before being fed to babies. They also need to be diluted with water when a baby is small. Any water used for dilution should also be boiled and cooled. Sugar should be added. If sugar is added to milk, it is preferable to boil the milk afterwards, as the sugar in most cases is not clean. The boiling requires fuel, and the mixing and cooling take time.

5) Breast milk does not need to be purchased

Most foods cost money, but the mother's milk is free. An infant who is 3 months old needs 600-700 ml of milk per day. If breast milk is not given, other milk must be purchased. In most ordinary homes this will mean a large part of the family's income. There will be extra cost for fuel. A mother should have extra food when she is breast feeding, but this costs only about a quarter or less of the price of buying milk. Illnesses are more common when you use other types of milk. Treatment of the illnesses will cost both time and money. Why waste money and invite illness by bottle feeding?

6) Breast feeding makes an intimate relationship between mother and baby.

Breast feeding permits a closeness between a baby and mother. Every human sense is involved in breast feeding. This contact includes touching, warmth, smell, looking, etc. If this close contact is started in the first hours of life, the relationship is especially strong. Breast feeding gives a feeling of security and love to the baby.

7) Breast feeding helps parents to space their children

When a mother breast feeds, her womb contracts. Mothers who breast feed do not menstruate as soon after delivery as mothers who give artificial feeding. Mothers who breast feed do not generally become pregnant again so soon. Breast feeding, therefore, helps in spacing children. Of course, breast feeding is not a certain way of avoiding pregnancy. If parents want to be sure of not having another baby too soon, they should use some other contraceptive method in addition to breast feeding. Most contraceptive pills should not be used by a mother who is breast feeding; they decrease the amount of milk she produces.

2. Questions and practical points about breast feeding

Most mothers know how to breast feed. They learn by watching others and perfect the art very quickly. So encourage mothers to always breast feed their babies. Following are some practical tips and answers to common questions being asked by mothers about breast feeding.

Q. When should mothers start breast feeding?

A. A mother should put her baby to her breasts on the day baby is born. It is best to start very early, within 1 or 2 hours of birth.

Q. Should the first watery milk that comes before the regular milk be given to the baby?

A. Yes. This first milk is called colostrum. Colostrum is very good for the baby. It protects the baby from infectious diseases such as diarrhea. The regular milk comes on the third to sixth day after birth.

Q. Can all mothers breast feed their babies?

A. Yes, practically all. There are very few conditions in which a mother cannot feed her baby. If one has difficulty, help should be sought from the health centre.

Q. How do you put the baby to the breast?

A. A mother normally knows this. The baby should suck from both breasts at each feed. Feeding should start with the right breast on one occasion, and the left breast on another. If the mother can relax, the milk will flow easily and she and the baby will enjoy the closeness and satisfaction of breast feeding.

Q. How often should mother breast feed?

A. The more often the baby sucks, the more breast milk will be

produced by the mother. Allow the baby to breast feed whenever he wants. During the first few days the baby will cry when he wants milk. Try to regulate the breast feeding according to your life style.

Q. How long should a baby be fed each time:

A. The baby should be allowed to suck for as long as he wants. At first the time may be quite short, 5-10 minutes from each side. When the baby gets older and stronger, he will suck for a longer time because he needs more milk.

Q. Should the baby be fed at night?

A. Small babies need to be fed at night. In the first few weeks of life, most babies wake up with hunger in night. They need extra feeding. In many countries babies sleep next to their mothers. Babies enjoy the warmth and closeness of the mother's body. Many babies feed in the night, sometimes without waking the mother.

Q. Up to what age should a child be breast fed?

A. A baby should breast feed for as long as possible. It is good to breast feed for at least one year. Breast milk is still important for growth in the second year.

Q. How do you know if the baby is getting enough breast milk?

A. Most mothers produce enough milk for a baby to grow well for the first 4-6 months of life. Growth should be measured by weighing the baby regularly and comparing the weight with a standard on the growth chart.

Q. How quickly should breast feeding be stopped?

A. It should be done gradually. Other foods should first be introduced step-by-step over a period of 2-3 months.

Q. Should breast feeding be stopped if the mother becomes pregnant?

A. It is not necessary. The quality of her milk will still be good, but the quantity may decrease. However, it is not good for a mother to become pregnant soon when she has a small baby. She will not be able to give the first child breast milk long enough.

Q. What can a working mother do about feeding her baby when she is away at work?

A. She should try and take baby with her. The baby can be fed anywhere. If she must leave the baby, another mother may give the baby a breast feed.

Q. Should the baby be given occasional feeds from a bottle?

A. No. A small baby does not need extra feeds from a bottle. Mother's milk provides all that a young baby needs. Boiled water should be given with a spoon or a special feeding cup if a baby has diarrhea or fever, but breast feeding should continue. Bottles are often dirty, difficult to clean, and can be dangerous. Older children can drink from a cup.

Q. Can contraceptive pills be taken while breast feeding?

A. Some contraceptive pills reduce the amount of breast milk. Breast feeding mothers should use pills which do not affect milk production or preferably use other methods of avoiding pregnancy during the period of breast feeding. Consult your doctor at nearby health centre or hospital.

3. The risk and cost of bottle feeding.

In the earlier section we discussed what a good food breast milk is for babies, and how important it is that mothers breast feed their infants as long as they can. Now we will discuss how dangerous and expensive bottle feeding can be, and how difficult it is for a village mother to make a good, clean, safe bottle feed. As illustrated in

Figure 2, bottle feeding is impossible for most poor mothers and that, if not properly done, it can kill a child. Following are two major reasons why bottle-feeding is costly and dangerous and not a very good practice for mothers.

- 1) Starvation: A young baby needs a lot of milk. Powdered milk is expensive, and many mothers do not have the money to buy enough milk. They do not put enough milk powder into each bottle of water, and do not give their children enough feeds each day. Their babies thus have too little food and become thin and marasmic. Marasmus is often caused by children not getting enough milk in their bottles. "Bottle feeding is often bottle starvation".
- 2) Infection: Micro-organisms (germs) like growing in milk and grow quickly in warm, dirty, feeding bottles. If even a little milk is left in a feeding bottle after a feed, micro-organisms will grow in it. When more milk is put in the bottle, they will grow in this milk also. If a baby is given a feed of dirty milk made with dirty water and with many micro-organisms in it, he will get diarrhea and may die. To prevent infection, we have to kill the harmful micro-organisms in a feeding bottle, in water, on dirty hands, and on utensils such as cup and spoon. The best way of doing this is usually to kill them by using boiling water to make the milk and to clean everything used for preparing milk and bottle feeding.

Mothers sometimes make a bottle feed by putting a little powdered milk in unclean water until it looks a little while like milk. They do not understand that a bottle of milk made like this is nothing like fresh milk or breast milk. No wonder bottle fed babies often die. Starvation and diarrhea due to infection are both dangerous.

4. Feeding a baby when breast milk is not adequate.

It is desirable to go on giving a child breast milk as long as you can, even if the amount may not be adequate. The next thing to do is to give artificial feeds as safe as possible. The best way to do this is to feed the child with a cup and spoon or a jug, but not with a bottle (Figure 3). Wash and then boil these utensils before use. They are all much easier to clean than a bottle which, if not cleaned properly, can give the baby diarrhea.

1) The best kind of milk to buy for a baby: After mother's milk, the next best food for a child is cow's milk. We can make cow's milk a little more like mother's milk by adding a little water and some sugar. Some use fresh cow's milk in this way, but it is probably best for most mothers to use the cheapest kind of full cream dried milk and add sugar to it. Mother should not use dried skim milk because it has no fat and therefore not enough energy and vitamins for the baby. Mother should not use condensed milk because it contains too much sugar which may cause malnutrition and diarrhea. Mothers with inadequate income should not use commercial infant formulas as they are very, very expensive.

2) Making the baby feed: In Figure 4 are shown steps for making a cup and spoon feed for a baby. Wash and then boil all utensils before use. Use always boiled water. Mix only the amount needed for one feed.

3) Using fresh cow's milk: This is often a little cheaper than dried full cream milk, but it is not so convenient and easy to use because it soon goes sour. Even so, some mothers may want to use it. Add one cup of water to three cups of fresh cow's milk, and add one heaped teaspoonful of sugar to each cupful of milk. Boil it before feeding with a clean cup-and-spoon or a jug. Boiled milk is more easily digested, and boiling also kills any micro-organisms that may be in the milk, water, and sugar.

- 4) How much milk to give the baby: Artificial feeding most often goes wrong because babies do not get enough milk, either because the milk is weak and watery, or they are not fed often enough. Follow the following guideline to feed young babies artificially:
- Feed your baby five times a day.
 - A newborn baby needs half a cupful of milk at each feed. This comes to 2 1/2 cups of milk a day.
 - A 5 month old baby needs a cupful of milk at each feed. This comes to 5 cups of milk a day.

Summary

- Mother's milk is the best food for babies.
- Breast feeding is better than artificial feeding.
- A baby should breast feed as long as possible.
- If you have to feed artificially, cup and spoon or jug feeding is better than bottle feeding.
- Use full cream dried milk or fresh cow's milk but do not use dried skim milk or condensed milk.
- Use boiled milk and utensils cleaned in boiled water.

Questions

1. As some questions on breast feeding from section 2 of this lesson.
2. Ask some simple questions on artificial feeding as outlined in sections 3 and 4 of this lesson.



Figure 1



Figure 2



Figure 3



Figure 4

LESSON 4

Feeding Young Children for Better Health

Educational Objectives

1. Learn about local foods which are suitable for young children.
2. Learn about preparing and mixing local foods for children of different ages.
3. Learning about correct feeding practices with respect to: how, when, how often and how much.
4. Learn what to feed and what to do when young children are sick with fever and diarrhea.

Content and Illustrations

Breast milk is an excellent food for young children and breast feeding should be continued at least for 6 months and up to 1 year, and into the second year. However, after 4-5 months, breast milk alone is not enough to make an infant grow well. Other foods are also needed. In the following section we will learn about local foods which are suitable for young children.

1. Local foods which are suitable for young children

Some foods are better than others for the growth and health of young children. While children are still being breast fed, they do not need many other foods. As they grow older, children need more variety of foods. The most important groups of food are as follows;

CEREALS: rice, maize, wheat, millet, etc.

LEGUMES: common beans, soybeans, lentils, peas, peanuts, etc.

VEGETABLES & FRUITS: leafy green and other vegetables, and fruits.

ANIMAL FOODS: milk, meat, poultry, eggs and fish.

OILS & SUGAR: vegetable oils from soybean, corn, etc., common sugar.

Cereals are the largest part of the diet for most young children. Most often young children are fed cassava, potatoes, sweet potatoes and bananas instead, are also given beverages such as coffee, tea, and carbonated and other drinks. These are not good for proper growth and good health of young children. Cereals and legumes cooked properly make an excellent basic food combination for infants.

All young children should gradually be given food from the first three groups as listed above, namely cereals, legumes and fruits and vegetables, especially green leaves. When it is possible, small amounts of the animal foods such as milk, eggs, meat, fish, etc. can also be given, though these are not essential. Some oil added to food or cooked with it is especially useful, because it gives much energy and also makes food soft and tasty.

2. Preparing and mixing local foods for children

Hands should always be washed properly with soap and water before preparing food for feeding the children. Very small germs from dirty hands can be passed on to the food. These germs are not visible, but they will be eaten with the food and may cause diarrhea and other illnesses. Cooking kills most germs. After cooking, handle food as little as possible and keep it in clean, covered container, to prevent contamination from dirt, flies and insects.

1) Food for infants up to 6 months

A baby has no teeth and since he is only used to breast milk, the first foods given to him should be soft and with no strong spices such as chili pepper, curry, etc. The staple diet such as maize, rice or wheat should be used to make the first food for an infant. The cereal or cereal flour should be well cooked and mashed so that it is soft. It can also be made into porridge and introduced as shown in Figure 1. In the beginning, this porridge may be very thin, but as child grows older, the porridge should

be made thicker. A thick porridge is more nourishing than a thin, watery gruel.

If the cereal or porridge is cooked in oil, or if oil is added (margarine or butter can also be added but it is expensive), it will increase the strength or energy in the food. Sugar, either white or brown, will also increase the energy in food, but it is not as good as oil. Habit of eating sweet foods is bad for the teeth.

2) Food for children 6 months to 1 year old

In the second half of the first year breast feeding should continue as shown in Figure 1. Once a child is eating the cereal porridge well, cooked legumes such as common beans, soybeans, lentils, peanuts and different types of commonly available seasonal vegetables (green leaves and others) can be mixed with cereal or porridge (Figure 1). Only small amounts should be given at first. Gradually increase the quantity, but do not force the child to eat more than he accepts. The vegetables should be very soft and mashed.

If a family eats animal foods and can afford to buy them, these can also be added. Meat or fish should be minced or finely chopped. A lightly boiled egg can be mixed with the porridge or given by itself. Milk from animals should be boiled before it is given to children. Dried whole milk can also be mixed into the porridge. None of these animal foods is essential for growth and health so long as adequate amounts and mixtures of plant foods are given. After introducing a new food, it is good to wait for a few days before introducing another food.

3) Food after the first year

After the first year, a child is usually able to eat the food prepared for the family. In other words he starts sharing the

family diet. It is good to separate a little food onto a separate plate for a young child. Care should be taken to have at least three kinds of foods, i.e. cereal, legume, and fruits or vegetables. In that way it is possible to see how much the child is given and how much he eats. During cooking, it may be necessary to remove a portion for a young child before adding strong spices.

The stools of a child will change when he starts eating a mixed diet. Mother should be warned about this. A healthy breast fed child has soft yellow stools. When a child eats other foods, the color, smell, and shape of stools will change. Stools will become more like adult stools.

3. Feeding young children: how, when and how often

1) At what age should food (other than breast milk) first be given?

Start solid food at about 4 or 5 months of age. Until then, breast milk supplies all the nourishment a young child needs. After that breast milk alone is not sufficient.

2) How many times a day should a young child be fed?

At first when a baby is still being breast fed, give cereal porridge, 1-2 small spoonful twice a day. The amount and the number of feeds per day should be increased gradually. By 6-9 months of age, a child should be fed 3-4 times a day, in addition to breast feeds.

3) How should the meals be timed in relation to the breast feeds?

At first, when a child is learning to take new foods, give the food when the child is hungry before breast feeds. When the child is taking the porridge or mixtures well, give the

breast feed first and then the meal. In this way, the baby will suck the breast hard because he will be hungry. This will encourage a continued supply of breast milk. Remember, breast feeding should continue for 2 full years as discussed in the previous lesson.

4) How much food should a child take at one meal?

If he is just starting to eat, or if a new food is being introduced, 2 small spoonsful may be enough. Once he is used to the new food and flavour, he should be given at least 3 large spoonsful (tablespoons) of food for each meal. If he can take more, more should be given. If he is unwilling to take this amount, it may be necessary to divide the amount into 2 smaller meals. If this is done, the amount preserved for the second small meal should be carefully protected from flies and dust in a covered container. It should be preserved for 1-2 hours, not longer.

5) Feeding small children should be priority within the family.

Feed the young child first because he eats slowly and cannot compete with older children and adults for the limited food prepared for a meal. Feed the girls as much and as frequently as the boys. By the time a child is 2 years old he or she should eat half as much as an adult. It is good for a small child to have his own plate and portion of food.

6) How do you know if a child is getting enough food?

Weigh him regularly and plot the weights on a weight chart and compare with the standard growth curve as shown in an earlier lesson.

4. What do do when a child is sick and with diarrhea?

When a child is ill or has diarrhea, he still needs nourishment. He may lose his appetite, but he needs strength to get better from the illness. Time and care must be taken to help an ill child eat enough food.

1) Sick children need plenty of protein food

Milk is the best food for a sick child, and mother's milk is the best food for a sick baby. Mother's milk is the best medicine.

When an older child is sick, don't stop trying to feed him when he won't eat. He may not like his usual food, so make something special for him that he likes. Often he will eat porridge or bread and milk. Try to give him some protein foods such as eggs or milk, (instead of just watery foods like thin soup).

2) What to do when child has diarrhea?

Many children have diarrhea due to the ingestion of infection causing germs from dirty hands, water, food and unhygienic conditons. Diarrhea causes malnutrition by preventing food being digested and absorbed properly. Thus, diarrhea helps to cause malnutrition and malnutrition helps to cause diarrhea, a vicious cycle as shown in Figure 2.

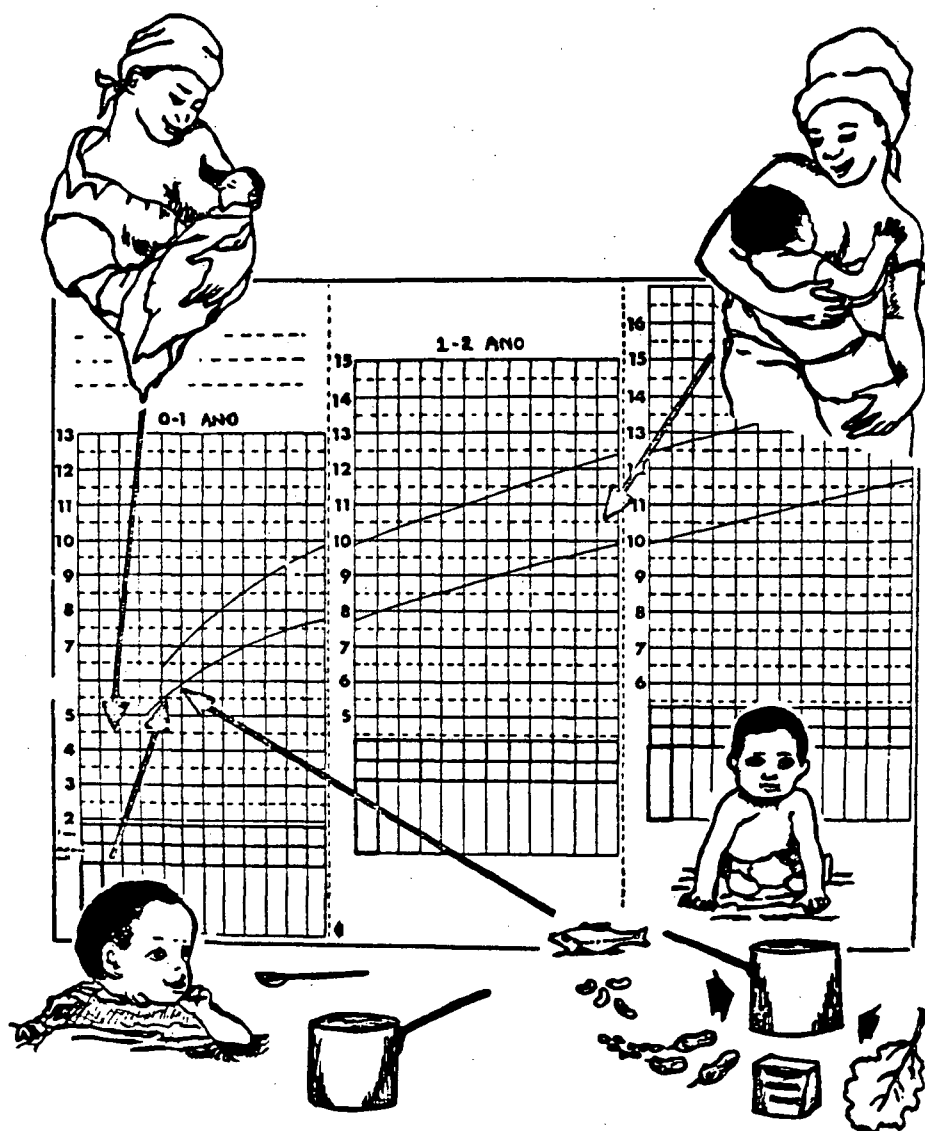
The only way to break the vicious cycle of malnutrition and diarrhea, is to feed a child well with protein foods, such as porridge with milk and/or eggs, bread and milk, etc. It may take several days to recover from diarrhea and malnutrition, so don't stop trying.

3) Diarrhea and dehydration

When a child gets diarrhea, his body loses water and salts in his stools. When child dies from diarrhea, it is due to drying or dehydration or simply loss of water and salt from the body. This can easily be put back by giving child salt-and-sugar water as soon as diarrhea starts. Add a quarter of a teaspoonful or a three-finger pinch of salt as shown in Figure 3 and two teaspoonsful of sugar to each cup of clean water. More salt or more sugar than this will not help the child - he may vomit and be worse. Give plenty of this salt and sugar water soon after diarrhea starts and continue giving slowly, even if the child doesn't like it, with cup and spoon. Salt and sugar water is the best "medicine" for most common diarrhea. Consult the health centre or doctor, if necessary.

Questions

Ask some simple questions from the material presented and discussed in this lesson.



ALIMENTANDO A CRIANÇA PEQUENA

FIGURA 1.

Figure 1

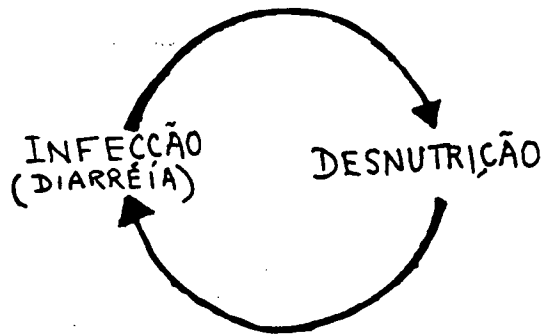


FIGURA 2. UM CIRCULO VICIOSO

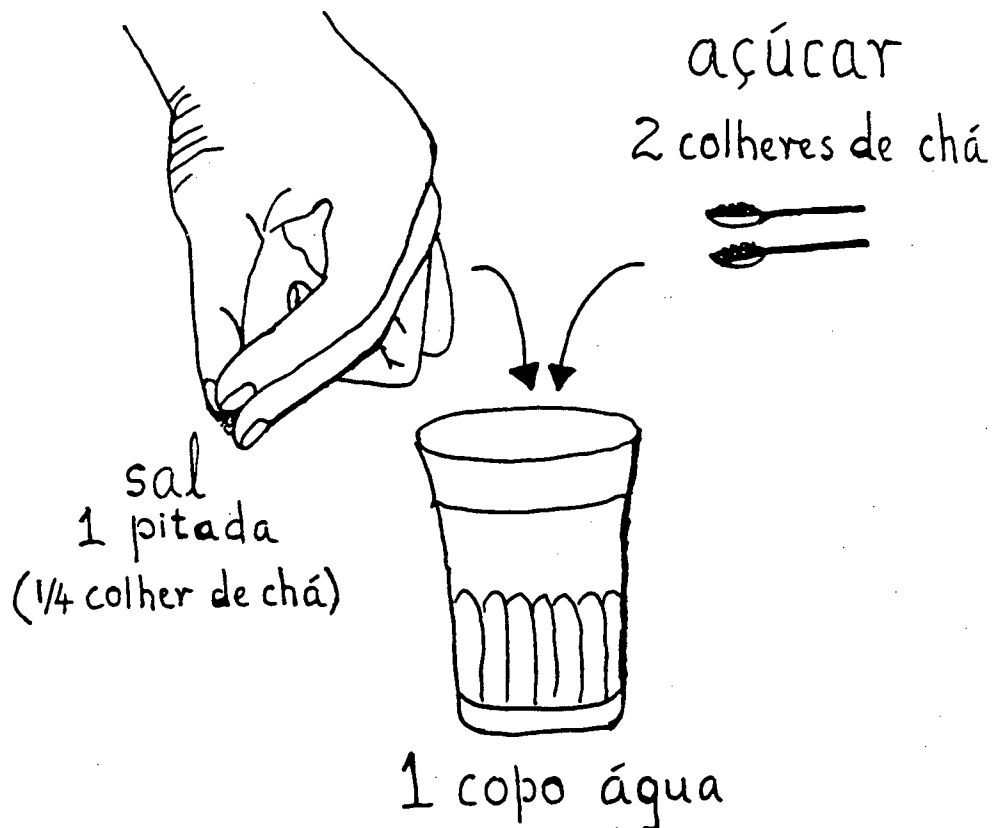


FIGURA 3. REMÉDIO PARA DIARRÉIA COMUM

LESSON 5

Nutrition of the Mother

Educational Objectives

1. Understand the local beliefs and practices about different foods and feeding during pregnancy and lactation.
2. Explain to mothers-to-be and mothers the importance of a proper diet during pregnancy and lactation.
3. Detect which mothers are at risk of malnutrition during pregnancy and lactation.
4. Detect anemia by examining the inner side of lips and eyelids.
5. Advise mothers on suitable diets for pregnancy and lactation.

Content

1. Beliefs and practices about foods in pregnancy and lactation

Pregnancy is a time when a new person is being formed inside the body of the mother. The unborn child is completely dependent on the health and well-being of the mother. If a mother has some disease, the baby may be affected. If a mother does not have enough food, the baby may be small and weak.

There are many beliefs and practices about pregnancy in different cultures. Some of these concern the relationship between what the mother eats and how the child will develop. Certain foods are believed to produce a child of different characteristics: brave or cowardly, beautiful or ugly, generous or selfish, etc. There is no scientific evidence for these beliefs.

In many countries, mothers believe that if they eat too much, the baby will grow too big. They think that a big baby will cause a long, painful and difficult delivery. This is not true and it is a harmful belief. Even if mothers eat a lot, the baby will not grow larger than

a certain size. The size of the baby is limited by the size of the womb. If a mother eats well, both she and her baby will be strong and healthy at the time of delivery.

In some cultures, pregnant women are given special foods. These foods will often be nutritious. These are good practices and we should encourage them.

There are also special beliefs and practices about diet and breast milk in different cultures. If a mother eats certain foods, it is believed that her milk may be spoilt or unsuitable for her child. Other foods are believed to increase the flow of milk.

Identify specific beliefs and practices concerning food and discuss its merits and demerits. Customs which favour better nutrition should be encouraged and promoted. Customs which are bad have to be tactfully discouraged.

2. Nutrition and health during pregnancy and lactation

During pregnancy, the mother needs extra food in order to make the baby strong and healthy. Therefore, the mother should have a diet which contains all the raw materials needed for forming strong bones and tissues. A mother needs not only extra food, but also certain types of food.

Mothers who do not have enough food during pregnancy will have smaller babies. Their babies will have a low birth weight. Small babies are often weak and not healthy. There are more illnesses and deaths among small babies than among larger, normal sized babies. Low birth weight babies are especially at risk of becoming malnourished. Therefore, it is important for pregnant women to have enough food.

If a mother has a good diet during pregnancy, she becomes heavier and puts on fat. Her abdomen enlarges because her womb becomes bigger with the growing baby inside. Her breasts enlarge and get ready to produce milk. She collects a layer of fat under the skin. This is important because it is this stored fat that is used to make much of

the milk in the months when she is breast feeding. If she does not have enough fat when she is pregnant, she will not store enough fat, and if she does not have enough fat, she will not produce enough milk.

The diet of a women when she is breast feeding her child is also important. The food a mother eats is partly turned into breast milk. If she does not eat enough food, or does not eat foods with the right nutrients, she will have less milk. A mother makes 500-750 ml of milk per day. This depends on a regular supply of food. If a mother continues to breast feed for several months without having enough food, she will soon become weak.

The amount of food a mother needs in both pregnancy and lactation also depends on the amount of work she does. If a woman has to do long hours of heavy work, she must have more food than a mother who does not work. During pregnancy and lactation, a mother should rest more so her food can be used to help her baby grow. She should rest when she is tired, so that she can protect the health of the baby-to-beand of herself.

3. Malnutrition in pregnant women

There is no precise way of detecting which mothers are under-nourished during pregnancy. There are some women, however, among whom malnutrition in pregnancy can be suspected. They include:

- women who are at a "high risk" such as those who are poor, widows, and those who have many children more frequently.
- women whose previous babies have been small and malnourished.
- women who are suffering from diseases such as tuberculosis.

The appearance of a pregnant woman can suggest whether or not she is malnourished. Observe if she is generally thin or wasted. See if there are loose folds of skin over her upper arms, chest, or abdomen, or if her arms and legs are very thin. These signs will tell you whether or not she has stores of fat under her skin. If a woman shows these signs, she is probably malnourished.

All mothers suspected of being malnourished need extra help. They should be visited often. They should be encouraged to eat as much food as they can afford. IF IRON OR OTHER FOOD SUPPLEMENTS ARE AVAILABLE, PREGNANT WOMEN SHOULD RECEIVE THESE AS A PRIORITY.

4. Anemia in pregnancy

Anemia is a common nutritional problem in pregnancy. In countries or regions with a high incidence of hookworm infestation, anemia is a very common problem. Women need healthy blood to nourish their babies during pregnancy.

How to tell whether a woman is anemic

An anemic woman will not have enough red colour in her blood. The blood will be pale, and if we look at the inner side of the lips or the lower eyelids, they will be light pink, or white. These should normally look red. If a woman is very anemic, she will easily become breathless after little exertion. Her face and feet may become swollen. Any woman in this severe condition should be referred to the nearest hospital or the nearest health centre.

5. A good diet for pregnancy and lactation

During pregnancy and lactation, a woman needs more food and a greater variety of food. More food is the first and most important thing. Diets based on cereals are generally good, but the woman needs more of them. She should eat one-fourth more food than she was eating before she became pregnant (25% extra). Find out how much she was eating before. Divide that into 4 portions. Tell her, or better show her, how much one of these portions is. This is the extra food she should eat, not only in pregnancy, but right through lactation. A pregnant woman or a lactating mother must truly "eat for two people".

A variety of foods will supply most of the nutrients a pregnant woman needs. The cereal grains which are suitable for her diet

include wheat, maize, sorghum, rice, and millet. It is better not to use refined or polished cereals because the nutritious part of the cereals is lost during such processing. Brown rice is more nutritious than polished white rice. Similarly, brown wheat flour (whole flour) is better than white refined flour. Legumes or pulses are valuable, particularly for those who cannot afford animal foods or who do not eat them. The legumes include soy, peas, beans, lentils, etc. Vegetables, especially dark green leafy and coloured ones, such as tomatoes and carrots, supply special nutrients. Other vegetables and fruits are also useful. Edible oils and butter and its derivatives make food more tasty. Animal foods are valuable, but not essential.

Anemia in pregnancy can be treated by a good mixed diet, like the one described above. However, the main nutrient that is required in the treatment of anemia is iron. It is difficult to increase very much the intake of iron with diet alone. In many countries, iron tablets are supplied to all pregnant mothers. One iron tablet should be taken every day with food. In pregnancy, this should be taken from at least the third or fourth month onwards. Women should be warned that if they take iron tablets regularly, their stools will be black in colour.

Activities

1. Finding out and classifying beliefs

Ask them about their traditional beliefs regarding food and diet during pregnancy and lactation. All the beliefs should be classified into the 4 groups given below:

- a) good for nutrition - these should be encouraged
- b) bad for nutrition - these should be tactfully discouraged
- c) unimportant to nutrition
- d) uncertain relationship to nutrition

2. Planning and setting up demonstrations to teach pregnant women and lactating mothers about nutrition

- 1) Show two bottles containing 700 ml of milk. This is the amount of milk a healthy woman can produce daily 3 months after delivery.
- 2) Show an average daily diet of the community. Next to it show how this diet can be made suitable for a pregnant woman and a lactating mother. In particular, it should contain more food (25% more) and a better variety of food, especially green leafy vegetables. Explain the reasons for selecting certain types of food during pregnancy and lactation.
- 3) Demonstrate ways of increasing the nutritive value of foods commonly taken in the area; e.g., by introducing soy, by allowing beans to sprout, by fermenting cereals and by using the water in which rice or vegetables have been cooked. This water contains vitamins and minerals which have been removed during cooking.

LESSON 6

Socioeconomic Aspects of Nutrition

Educational Objectives

1. How to eat well with low income and lack of land.
2. Learning to select nutritious food at low cost.
3. Recognition of foods and beverages improper for health.
4. Understanding prejudicious beliefs and practices regarding food.

Contents

1. HOW TO EAT WELL WITH LOW INCOME AND LACK OF LAND

There are ways and means for people to eat well with less money to spend. These include effective use of available land, by rotating food crops, terrace farming and irrigation, by raising rabbits, goats, sheep, fish and bees, better storage of grains and planting family orchards and vegetable gardens. If the whole community or a group of families work together in these activities, much can be done to improve the nutrition. When land, as well as other resources are limited, it is better to plan for the future and limit the number of children according to your ability to nourish them adequately. Hungry children do not work nor study well, and many of them die.

When money is short, it is important to use it wisely. This requires cooperation and planning. Often the father of a poor family wastes his hard earned money in buying alcoholic beverages and cigarettes, instead of buying nutritious foods, a chicken for laying eggs, or something which can promote the health of the family. The men that drink together should have meetings when sober to discuss these problems and to think about appropriate solutions for the health of their families.

Sometimes, mothers buy sweets or soft drinks for their children when they could spend the same amount of money to buy eggs, milk, or other nutritious foods. This way children could achieve better health with the same amount of money. If you want to help your children to grow well, do not buy soft drinks nor sweets, buy instead eggs or other nutritious foods.

In some places soft drinks are very popular. Many times a poor mother buys soft drinks for her malnourished child when she ought to use the same money for buying fruits or eggs or other nutritious foods.

Soft drinks do not have nutritive value. Children who drink soft drinks soon suffer from caries and other dental problems. Soft drinks are even worse for persons with indigestion problems and stomach ulcer. Home made fresh fruit juices are more healthy and are less expensive than soft drinks. Do not let your children become habituated to soft drinks.

2. BETTER FOODS AT LOWER COST

Many persons consume foods rich in starch and sugars, and do not ingest adequate quantities of foods rich in proteins, vitamins and minerals. This is so because most of these "better foods" are more expensive. Animal protein foods such as milk and meat are quite nutritious, but expensive as well. If possible, raise small animals that can provide meat, milk or eggs.

Majority of people cannot afford so much food of animal origin. But poor families in general can provide more protein and better nutrition by planting or buying foods of vegetable origin rich in protein such as beans, peas, lentils, peanuts, pine nuts, which are less expensive than the foods of animal origin, such as meat and fish. People can be strong and healthy eating proteins of plant origin.

Nevertheless, it is good to eat a small amount of protein of animal origin in most meals. This is because even plant foods with high amount of protein do not contain all the amino acids in adequate amount necessary for our body.

Try to eat several varieties of foods of plant origin and not only one or two. Different plant foods provide different vitamins and minerals to our body. For example, it is better for our body to eat both beans and maize than to eat just beans or just maize. It is even better if, in addition, we eat other vegetables and fruits.

The following are some of the suggestions to obtain more proteins, vitamins and minerals at low cost:

- 1) Breast milk: This is the cheapest, healthiest and most complete food for a child. A mother should eat plenty of plant and animal proteins to transform these into the most perfect food for a baby - the breast milk. Breast feeding is not only best for the baby, but it is also economical.
- 2) Eggs and poultry: In many places eggs provide the cheapest and best form of animal protein. They can be mixed with other foods that we give to substitute breast milk. Eggs should be given in addition to the breast milk for rapidly growing infants.

Poultry is a good source of protein, and certainly inexpensive when a family grows its own.
- 3) Liver, heart, kidney and blood: These are very rich in proteins, vitamins and iron (against anemia) and are often cheaper than other meat. Fish is often cheaper than other meat and is also very nutritious.

- 4) Beans, soybeans, peas and lentils: These are good and inexpensive sources of protein, especially soybean. When sprouted and cooked, they provide more vitamins. Beans, when cooked, mashed and sieved, can also be given to the babies.

Beans, soybean, peas and other legumes are not only a cheap source of protein, but planting them enriches the soil and provides better harvesting in the subsequent years. Therefore, rotation of crops with legumes is a good idea.

- 5) Dark green leafy vegetables: have some protein, some iron and much more vitamin A. Leaves of sweet potatoes, beans, peas, pumpkin and squash are very nutritious. We can dry them and grind them to mix with the porridge for infants so as to increase the quantity of protein or vitamins.

Light green leafy vegetables, such as lettuce and cabbage, have less amount of protein or vitamins. From a nutrition point of view, they are not worth planting.

- 6) Manioc leaves: Contain seven times more protein and vitamins than their roots. Eating leaves together with roots increases the nutritive value without increasing the cost. The new tender leaves are the best.

- 7) Dry corn: When soaked in alkali before cooking (as is the custom in most of South America), the corn becomes rich in calcium. Soaking in alkali also facilitates availability of vitamins (niacin) and proteins to the body.

- 8) Rice, wheat and other cereals: Are more nutritious when husks and bran are not removed during milling. Whole grain rice and wheat contain more vitamins than processed products such as polished white rice and white flour.

- 9) Cook vegetables, rice and other foods: in little water and do not over cook. This way one loses less vitamins and minerals. The cooking water can be drunk or used in soups.
- 10) Many wild fruits and berries: are rich in vitamin C and natural sugars. They can be good sources of vitamins. (Naturally, we should eat only those fruits and berries which are not poisonous). Cashew fruits and others are rich in vitamin C.
- 11) Products for children and pregnant women: are distributed by the government in schools and health centres. These are products made with soybean, corn, peanut, manioc flour, etc. that increase the nutritional value of the diet.

3. RECOGNITION OF FOODS AND BEVERAGES IMPROPER FOR HEALTH

Many people believe there are several foods which are improper for health or should not be eaten when one is sick. Others believe that there are "hot" and "cold" foods. They think that one should not eat "hot" food during "hot" sicknesses, nor should one eat "cold" during "cold" sicknesses. Still others believe that certain foods are improper for mother with a newborn baby. Most of these beliefs are more harmful than beneficial for health. Most often the foods are considered harmful because of these beliefs are, in fact, just the food they should be eating to recover from sickness.

A sick person, in fact, needs more nutritious foods than a healthy individual. Instead of being too concerned about that it could be harmful, it is better to think about food that can help recover from the sickness and become healthy, for example: fruits, vegetables, milk, meat, eggs and fish. As a general rule, the same foods considered as good for us when healthy are also good when we are sick.

Therefore, only the following should be avoided:

- alcohol: causes or aggravates problems of liver, stomach and nervous system
- smoking: can cause chronic cough, lung cancer or other problems. For persons with lung problems such as tuberculosis, asthma and bronchitis and also for pregnant women, smoking can be even worse.
- excessive use of fatty foods, spices or coffee can cause stomach ulcers or other problems of the digestive system.
- excessive use of sugar and sweets reduces appetite, damages teeth, causes obesity and heart problems. Artificial additives added to sweets and candies (for example, artificial colours), can cause cancer of intestinal and urinary systems. However, sugar can provide energy to a sick person or a malnourished child. However, brown sugar, honey, brown syrup and molasses are better than white sugar.

There are certain foods such as salt which are harmful to individuals suffering from high blood pressure, heart problems or swollen feet. Excessive use of salt is harmful for all. For persons with ulcer and diabetes, special diets are required.

4. UNDERSTANDING PREJUDICIOUS BELIEFS AND PRACTICES REGARDING FOOD

1) Diet of the mother after delivery

In many regions, there is a harmful belief that mother right after delivery cannot eat certain foods. This popular belief can cause weakness and anemia, due to forbidding nutritious foods and promoting less nutritious food such as corn starch, macaroni, watery rice and chicken soup. This can cause death because of reduced resistance to hemorrhage and infections. After delivery the mother should eat the most nutritious food she can obtain.

To counteract infections or blood loss and to produce sufficient milk for her child, a mother should eat plenty of foods rich in proteins such as beans, eggs, chicken, milk and milk products, meats, fish, fruits and vegetables. None of these foods are harmful to her, in fact, all are beneficial for her health.

- 2) It is not true that oranges, guava, pineapple or other fruits are harmful to a person suffering from cold, flu or coughs

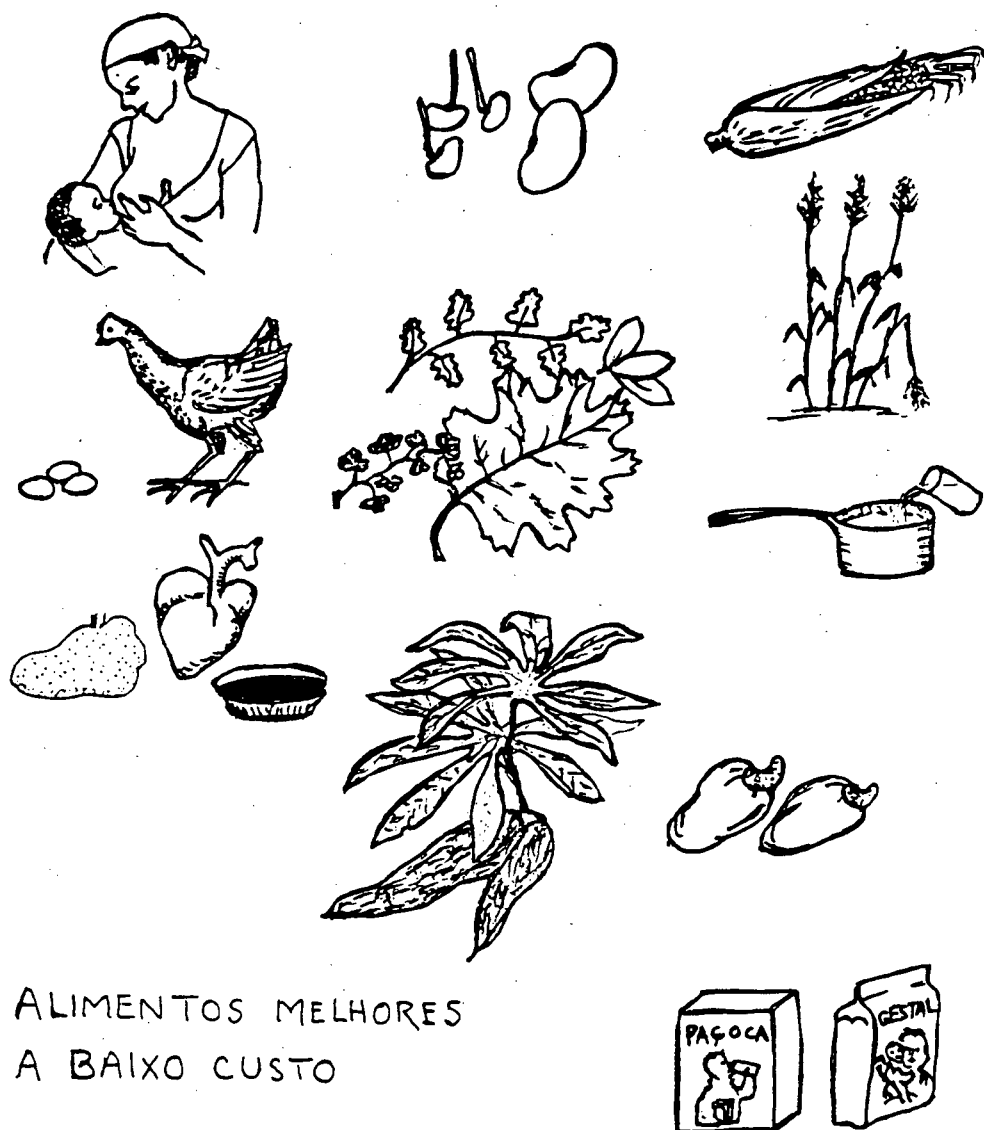
In fact, fruits such as oranges, guavas and pineapples are rich in vitamin C that will help the body to fight against colds and other infections.

- 3) It is not true that certain foods like pork, spices or certain fruits cannot be eaten together with medications

In fact, eating fatty and overly spiced foods can be more harmful for persons with digestive problems, irrespective of medication or not.

Questions

Ask simple and practical questions regarding subject matter explained in this lesson.



ALIMENTOS MELHORES
A BAIXO CUSTO

Figure 1

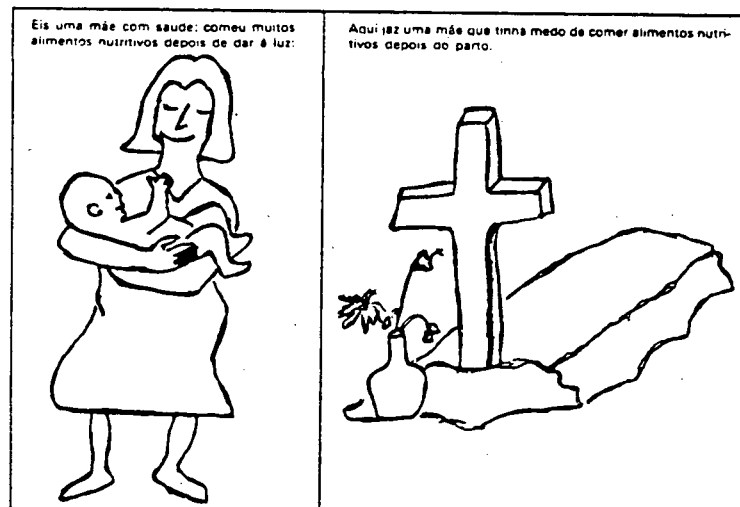
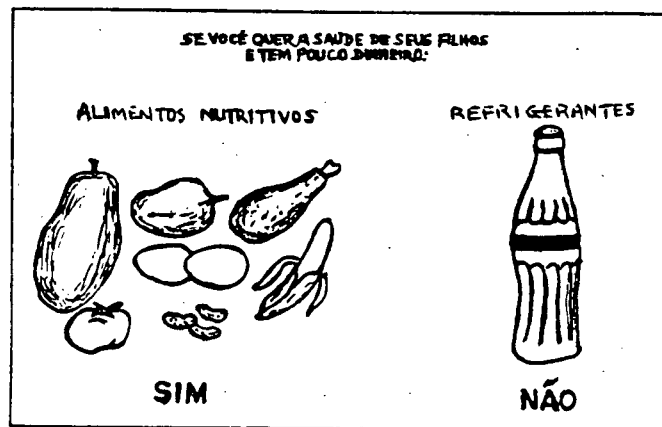


Figure 2

APPENDIX J

Formative Evaluation Questions for Instructors

1. Is the location suitable for women?
2. Do you think the illustrations are good, or not?
3. Is the length of the lesson too long, too short, or adequate?
4. Do you think women were interested during the session?
5. Do you think women understood the lesson or do you think there was some confusion?
6. Do you have any suggestions for changes in the lesson or manner of presentation?
7. Do you have any other comments or observations?

APPENDIX K

Formative Evaluation Outline for Primary Investigator

1. Location of the nutrition education session - name of household.
2. Physical facilities:
 - a) Was the size of yard or home adequate?
 - b) Seating facilities - adequate or not; was seating arrangement such that participants could see the instructor?
3. Weather - was weather a deterrent for attending the session?
4. Was the day of the week and time of day selected for the sessions convenient or not?
5. Nutrition education:
 - a) Length of session - too long, too short, or adequate?
 - b) Did the sessions begin more or less on time?
 - c) Were lesson objectives covered as planned?
 - d) Were audio visual aids suitable? Were all women able to see the audio visual materials?
 - e) Instructors: Were instructors prepared for the presentation, were instructors friendly, at ease with the audience; did instructors speak clearly and slowly; was presentation made in an informal manner and by means of a vocabulary the audience could understand? Was the audience encouraged to participate? Were questions asked to determine participants' comprehension? Did instructors review previous information?
 - f) Participants: Did participants arrive more or less on time? Were any participants present who had not attended previous sessions? Did participants seem enthusiastic, bored, interested, restless, attentive, or shy? Did participants ask questions? If children were present, were they a disruptive influence during the presentation? Did children participate? Were they enthusiastic?
6. Suggested changes or improvements; record of attendance.

APPENDIX L

Summative Evaluation Outline for Primary Investigator

1. Length of the nutrition education program.
2. Choice of location(s).
3. Weather.
4. Day of the week.
5. Participants.
6. Instructors.
7. Education material.
8. Other comments.